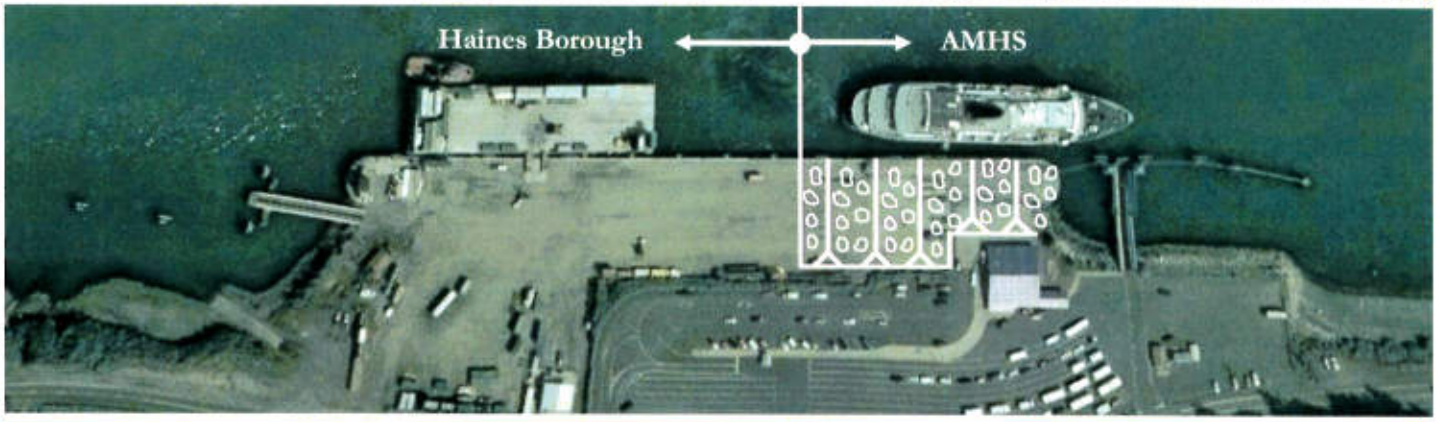


## Haines Borough

# Lutak Dock Design and Development Concepts

Respectfully Submitted By:
PND Engineers, Inc.
9360 Glacier Highway, Suite 100
Juneau, Alaska 99801

Dick Somerville, P.E.
dsomerville@pndengineers.com
P. 907.586.2093 F. 907.586.2099

September 2, 2016

Haines Borough

# LUTAK DOCK DESIGN DEVELOPMENT AND CONCEPTS

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**Dutch Harbor Pacific Stevedore Dock**

P | N | D

ENGINEERS, INC.

September 2 , 2016

PND 16J086

Haines Borough
P.O. Box 1209
Haines, AK 99827
Attn: Mr. Brad Ryan, Director of Public Facilities

Re: Request for Proposals: Lutak Dock Design and Development Concepts

Dear Mr. Brad Ryan and Selection Committee:

PND Engineers, Inc. is pleased to provide this proposal for your consideration on the Lutak Dock Design and Development Concepts project in Haines. The existing dock is near the end of its service life and is in need of replacement or refurbishment to ensure the continued use of this important facility.

PND specializes in waterfront and marine facility projects and has extensive engineering experience in Haines, throughout Alaska and the Pacific Northwest. The McDowell Group joins our team for public involvement and market research. Together we will provide the Haines Borough and the citizens of Haines with an innovative and experienced team of professionals uniquely qualified for this project. We are well-established Southeast Alaska businesses with a vested interest in the prosperity of our region. Our experience will be beneficial to the Borough in many ways, both technically and economically.

Our team recognizes the importance of the Lutak Dock to the prosperity of Haines and the regional economy. We will work closely with Borough staff and the community to develop a final conceptual design for the facility that will perform well over the long term and has the flexibility for future expansion. PND will enthusiastically embrace a teamwork approach with the community to properly plan the dock to meet Haines' specific needs.

PND has over thirty-five years of experience providing similar professional engineering services throughout Alaska. Our team has directly-related design experience with large dock projects and can economically resolve the technical challenges facing the Lutak Dock. We are a motivated team from Juneau that will respond rapidly and will conduct site visits and presentations without expensive travel costs. We strongly believe in working closely with our clients to comprehend the issues at hand and then develop cost effective solutions that stand the test of time and satisfy development criteria within budgetary constraints.

PND and McDowell are committed to providing comprehensive professional services effectively and efficiently and we welcome the opportunity to work for the Borough on this important dock project. PND has all the required insurances, registrations and professional licenses to perform services for this project. We will obtain a Haines business license upon notice of selection. Dick Somerville, P.E. is a principal of the firm and Vice President of PND's Southeast Operations with full corporate and contract authority. Thank you for reviewing our qualifications and we look forward to hearing from you.

Sincerely,
PND Engineers, Inc. | Juneau Office

Dick Somerville, P.E., Vice President

9360 Glacier Highway Suite 100 · Juneau, Alaska 99801 · Phone 907.586.2093 · Fax 907.586.2099

## 1. FIRM'S OVERALL QUALIFICATIONS AND EXPERIENCE — 20 POINTS

PND is an Alaskan corporation formed in 1979. The firm is head-quartered in Anchorage with additional offices in Juneau, Seattle and Houston. PND employs over 110 engineers, planners, surveyors, scientists and technicians. A professional staff of 60 registered professional engineers, three professional land surveyors, 15 civil engineers-in-training, and two staff engineers allows us to easily complete projects on time and within budget.

P | N | D ENGINEERS, INC.

PND's clients range from private individuals to Fortune 500 corporations to various governments, encompassing the wide diversity of groups in between. The bulk of our work is for small communities throughout southeast Alaska. We understand and are familiar with the passion and often polarized opinions residents often have for the community improvements. Many of our design solutions have received national awards and worldwide press attention. Our efficiency in design and the resultant savings in construction and operational costs are attractive to those organizations that must operate within a stringent financial environment. PND has long enjoyed the challenge of working for such clients and exhibits a "can-do" attitude.

**EXPERIENCE IN HAINES**

- Lutak Dock Condition Assessment & Structural Analysis
- Lutak Dock Bathymetry
- Port Chilkoot Dock
- Letnikof Cove Boarding Float
- Letnikof Cove Harbor Refurbishment
- Portage Cove Harbor Moorage Reconstruction
- Portage Cove Harbor Expansion
- Haines Street Improvements

PND maintains the capability to provide engineering services in many different disciplines, including: general civil, structural, geotechnical, marine, and coastal engineering; surveying; hydrology; sanitary/wastewater; value engineering; inspection; construction engineering; contract administration; fabrication inspection; permitting; right-of-way acquisition; and research and development.

This broad experience base gives PND the potential and flexibility to provide a diverse package of engineering services and to assign required personnel even on very short notice. PND maintains a sufficiently large work force to ensure a stable pool of professionals in Alaska at all times.

### MARINE ENGINEERING

Our marine engineers have wide-ranging experience in the design of waterfront structures such as bulkheads, dolphins, floats, pile supported docks, fender systems and boat launches. Services include planning and design for port and harbor development projects around the world.

### GEOTECHNICAL ENGINEERING

Our geotechnical engineers provide soils investigations, seismic analysis, and geotechnical design for both onshore and offshore projects such as: roadways, dams, bulkheads, retaining walls, buildings, bridges, breakwaters, docks, float systems, dredging, and mooring and ballasting structures.

### COASTAL ENGINEERING

Coastal engineering is focused on the shoreline, where water meets the land. The effect of tides, waves, and currents in sensitive marine environments can involve very demanding project and permit requirements. PND designs breakwaters, shoreline protection and wetland restoration systems routinely applying the specialized knowledge of our coastal engineers.

### SURVEYING

PND surveyors are fully equipped and regularly perform offshore bathymetric and onshore topographic surveys in support of our waterfront design and permitting projects.

Kodiak Pier 3

Nome OPEN CELL™ Dock

### CLIENT REFERENCES

1) Carl Uchytil, P.E., CBJ Port Director, 907-586-0294
2) Glorianne Wollen, Petersburg Harbormaster, 907-772-4688
3) Greg Meissner, Wrangell Harbormaster, 907-847-3736
4) Steve Corporon, City of Ketchikan Port Director, 907-228-6049
5) Dan Tadic, P.E., Sitka City Engineer, 907-747-1807

**PND "designs were well thought out and included input from my staff and the general public, and cost estimates were thorough and consistently accurate when compared to the actual costs to construct these projects"**
**-Steve Corporon, Ketchikan Port Director**

## Subconsultant Qualifications

McDowell Group

Business License #27574

McDowell Group has served Alaska's research needs for more than 40 years, conducting approximately 2,000 studies for over 400 public and private-sector clients. We recognize the important implications that transportation has on quality of life, economic development, and community viability. We offer balanced, objective research into the economic and social impacts of transportation development.

Our staff has extensive experience using travel demand models, survey research, case studies, stakeholder interviews and other research tools to prepare long-range traffic forecasts, benefit-cost analyses, and feasibility studies.

We are also experienced in developing and implementing public involvement plans including survey research, facilitation of public meetings, media outreach, and preparation of public notices, bulletins, and project websites.

We provide a selection of projects below that demonstrate our experience with Haines, other Alaska ports, waterfront development, and maritime projects. Many of these projects included facilitation of public meetings, presentations, and public opinion research.

- Port Chilkoot Cruise Ship Dock Market Study
- Haines Downtown Planning
- Haines Tourism Development Plan
- Haines Cruise Ship and Fast Ferry Passenger Survey
- Port of Valdez Market Analysis
- Southcentral Marine Freight Transportation Analysis (Port of Anchorage)
- Southcentral Ports Development Project
- Trends and Opportunities in Alaska's Maritime Support Sector
- Freight Consolidation Study
- Tolstoi Bay Deepwater Port Feasibility Study
- Demand Assessment for New Harbor in Saxman
- Gustavas Dock Improvements Socioeconomic Impact Analysis
- Economic Impact of Icy Straight Point and a Proposed Multi-use Deepwater Dock

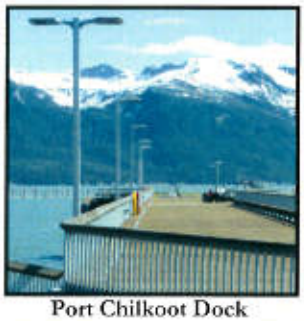
*References: Diane Kinney, Ports & Harbor Director City of Valdez, 907-835-4564; Larry Gaffaney, Huna Totem President & CEO, 907-523-3671.*

HAIGHT & ASSOCIATES CONSULTING ELECTRICAL ENGINEERS

526 Main Street Juneau, Alaska 99801 907-586-9788

Business License #291165
Corporate License #670

Haight & Associates, Inc., was established as B.C. Haight, Consulting Engineers in 1980. The firm incorporated as Haight & McLaughlin, Inc. in 1994, and reorganized as Haight & Associates, Inc. in 2002. Haight & Associates, Inc., is licensed in the State of Alaska to provide Electrical Engineering services. The firm has been serving Southeast Alaska for the past 35 years with design and construction services. Haight & Associates currently employs a full-time staff of six, including two professional engineers, two staff engineers, two drafter/designers and administrative staff.



Port Chilkoot Dock

### Southeast Alaska Experience

Haight & Associates, Inc. maintains their office in Juneau. Their services are offered throughout the state, but primarily in Southeast Alaska; and they have been participants in numerous projects in nearly every community. They have project experience in communities of similar size and character as Haines, including Skagway, Petersburg, and Wrangell, as well as their direct experience in Haines.

Haight & Associates has a long history of involvement with docks and harbor projects. These projects include large and small docks/wharfs for large vessel moorage, marinas for small vessel moorage, fueling facilities, and upland terminals. The engineering services provided by the firm involves medium & customer voltage power distribution, shore power pedestals, lighting, communications, fuel pumps and controls, cranes, sewage pump stations, and security cameras.

Haight & Associates, Inc. teams with PND regularly to provide engineering services for harbors, marinas and docks. Their work together fills most of their background of projects in Southeast Alaska including the Haines Port Chilkoot Dock, the Lutak Dock and Portage Cove Harbor. All of the HAI staff live in Southeast Alaska and routinely experience activities on the marine waterways. With this depth of experience, H&A is most responsive to marine type projects.

Haight & Associates has experience with the electrical systems on many of the docks, wharfs, freight yards, and bulk fuel facilities constructed in Southeast Alaska over the past fifteen years. These facilities have included electrical engineering support for lighting systems, bulk fuel pumps and dispensers, and refrigerated van power pedestals.

*References:*
*Rorie Watt, P.E., CBJ Engineering Director, 907-586-0877; Pat Carrol, P.E., ADOT Southcoast Preconstruction Engineer, 907-465-4415; Kirby Day, Princess Cruises & Tours Director of Shore Operations, 907-463-3900; Greg Meissner, Wrangell Harbormaster, 907-874-3736.*

## Project Team

Our team project management philosophy emphasizes communication, coordination, efficiency, technical expertise and fully understanding the project scope and objectives. This philosophy ensures that schedules and budgets are met and that all technical concerns are addressed. All work will be performed at PND's Juneau office. McDowell Group joins PND to assist with public meeting facilitation and Haight Engineers will address power and lighting issues. Brief resumes follow with full resumes in Appendix A.

**Haines Borough**
**PROJECT MANAGER & STEERING COMMITTEE**

**PRINCIPAL-IN-CHARGE/ PROJECT MANAGER**
Dick Somerville, P.E.

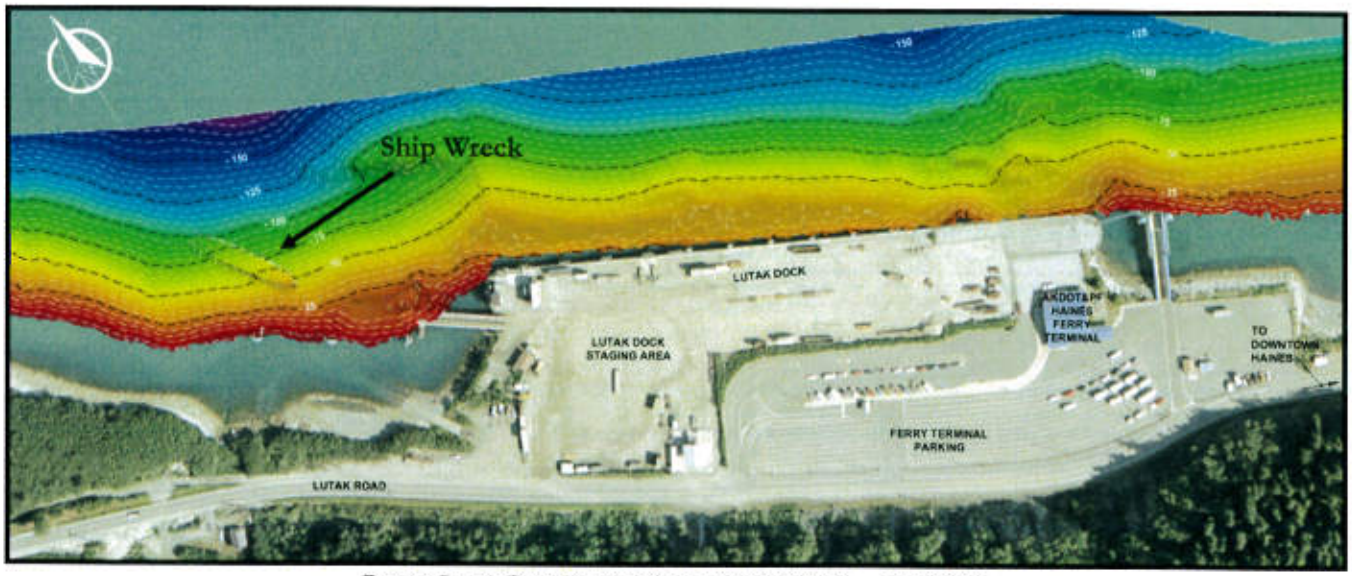
**ELECTRICAL DESIGN**
Haight & Associates, Inc.
Ben Haight, P.E.

**STRUCTURAL DESIGN**
Mike Huggins, P.E.
Rian Johnson, P.E., S.E.

**PUBLIC INVOLVEMENT**
McDowell Group
Susan Bell

**GEOTECHNICAL ENGINEERING**
Steven Halcomb, P.E., G.E.

**SURVEYING**
Maynard Taylor, P.L.S.




Recent Lutak Dock Bathymetry and Ship Wreck — PND 2013

**DICK SOMERVILLE, P.E.** — **Principal-In-Charge/Project Manager**
B.S. Civil Engineering — *Alaska CE 8845*

Mr. Somerville has 35 years of civil engineering and project management experience in Alaska. His background includes planning, permitting, site investigations, design, construction inspection and contract administration for a variety of public and private clients focusing on ports, harbors and waterfront projects. Following five years of employment with Alaska DOT&PF, Dick has worked in the private sector since 1980 and joined PND in 1987. Mr. Somerville is a principal of the firm and the manager of PND's Juneau Office, where he currently manages a staff of 18 engineers and technicians.

Lutak Dock

Mr. Somerville's engineering experience has included planning, design and construction projects. Projects have included large earthworks, coastal erosion control, water and sewer utility projects, dredging, bridges, docks, cranes, moorage floats, boat launch facilities, marine haulouts, breasting dolphins, retaining walls, sheet pile structures, harbor infrastructure, roadways, parking, staging and work yards. As a planning and design manager he has conducted public presentations, developed needs assessments, scoping studies, condition assessments, produced civil and marine facility designs, technical specifications, contract documents, permits and cost estimates on several hundred public and private projects in Alaska. He has extensive waterfront experience in Haines including the Lutak Dock Condition Assessment and Structural Analysis, Port Chilkoot Cruise Ship Dock, Letnikof Cove Harbor Refurbishment, Portage Cove Harbor Expansion, Portage Cove Moorage Reconstruction and the Letnikof Cove Boarding Float. He also has extensive experience in Southeast Alaska including the Petersburg Marine Terminal, Auke Bay Loading Facility and the Juneau Cruise Ship Berths to name as examples. *References: Carl Uchytil, P.E., CBJ Port Director, 907-586-0294; Glorianne Wollen, Petersburg Harbormaster, 907-772-4688; Steve Corporon, City of Ketchikan Port Director, 907-228-6049*

**MIKE HUGGINS, P.E.** — **Structural Engineering**
M.S. Civil Engineering — *Alaska CE 8097*

Tacoma Narrows Bridge

Mr. Huggins has 28 years of construction-related design experience holding the positions of Chief Engineer, Project Field Engineer and Estimator in a full range of marine heavy-civil construction. His technical capabilities include design/development and detailed estimating of broad-scope engineering systems, providing technical expertise and constructability review in design-build projects, and managing multi-discipline engineering work. Mr. Huggins served as the Chief Engineer/Senior Construction Engineer for General Construction Company from 1996 to 2003. Following a year with Tacoma Narrows Constructors, he joined PND and continues to work with national and regional contractors to solve construction engineering problems inherent while building complex marine and bridge structures. He has worked on projects including the Lutak Dock Investigation, New Orleans Permanent Canal Closure and Pumping Open Cell® Structures, United States Navy Hybrid Pier Development, La Farge Northwest Plant Bulkhead Replacement and the Navy Pier D Replacement in Washington. *References: Patrick Clarke, WSDOT Floating Bridge and Special Structures Design, 360-705-7220; Kent Werle, Kiewit Bridge and Marine (Hood Canal Floating Bridge), 253-943-4200; Gary Davis, Kiewit Bridge and Marine (Wanapum Dam), 253-943-4200.*

**RIAN JOHNSON, P.E.** — **Structural Engineering**
M.S. Civil Engineering — *Washington CE & SE 42785*

Juneau Cruise Ship Berths

Mr. Johnson is a civil and structural engineer specializing in marine construction, design, engineering, and administration. He has 15 years of experience in various areas of the engineering industry, including engineering consulting and public works. His recent work includes project management, on-site construction administration, marine facility design and utility surveys. Specialized skills include structural analysis and design, weld and pile driving inspection and contract administration. He has worked on all aspects of engineering for airports, marine ports, harbors, marine facilities, bridges, roadways, utilities and temporary construction works projects. Mr. Johnson's recent projects have given him extensive working knowledge of applicable design and construction codes including ASCE, USACE Engineering Manuals, AASHTO, ACI, AWS and API. He has worked on many projects in Southeast Alaska including the Juneau AJ Cruise Ship Dock, Port of Juneau Cruise Ship Berths, Ketchikan Port Berth III Reconfiguration and the Skagway Railroad Dock South Berth Extension. *References: Rob Mullins, Stantec Consulting Services (PCCP OPEN CELL™ Structures), 604-587-8400; Ariel Smith, City of Long Beach, WA (Long Beach Tsunami Safe Haven Berm), 360-642-4421; Shawn Wyatt, Cashman Dredging and Marine Contracting Co, LLC (Dockyard Land Reclamation Bulkhead), 617-890-0600.*

**STEVEN HALCOMB, P.E.**
M.S. Civil Engineering

**Geotechnical Engineering**
*Alaska CE 12939*

Statter Harbor Improvements

Mr. Halcomb has ten years of geotechnical, cold region and structural engineering experience through both professional and academic work. He has performed a multitude of geotechnical explorations using a variety of techniques from test pits to macro-coring including standard penetration and cone penetration tests. He has experience designing shallow and deep foundations in ideal and adverse conditions including liquefiable and expansive soils. He has extensive experience in Southeast Alaska, having performed testing for projects in Haines, Juneau and Prince of Wales Island. He has had a great deal of experience in slope stability and geotechnical earthquake engineering and retaining structures. He is very familiar with codes, regulations and design guides from AASHTO, ASTM, AREMA, API, IBC, NDS, AISC, ACI, NAVFAC, SNiP, UFC, FHWA, and ASCE. He has worked on projects including Portage Cove Harbor Expansion, Port of Juneau Cruise Ship Berths, Statter Harbor Improvements, Chignik Small Boat Harbor, Unalaska Marine Service Center, Robert Storrs Small Boat Harbor and the Kodiak Pier 3 Replacement. *References: Javier Fente, ExxonMobil, 832-374-6288; Dana Hayek, Contech Engineered Solutions, 907-223-7348; Leonard Barger, Native Village of Point Hope, 907-368-2330.*

**MAYNARD TAYLOR, P.L.S.**
B.S. Political Science, Survey Technology

**Surveying**
*AK PLS #7624*

AJ Dock

Mr. Taylor has more than 40 years of surveying experience statewide, encompassing project management; large mapping projects; design surveys; boundary surveys; Alaska Tideland Surveys; hydrographic, photogrammetric control, subdivision, and as-built surveys. He has experience in U.S. Surveys for the Bureau of Land Management, DOT&PF highway construction surveys and construction inspection. He has a working knowledge of the newest survey technology, including electronic Theodolites with data collectors; GPS systems; depth sounders that allow positioning interface to be downloaded with depths via data collector; and the latest CAD software. He has considerable experience in the southeast, having performed projects in Juneau, Ketchikan, Petersburg, Sitka, Skagway, Akun Island, and Prince of Wales Island. He has served as either lead surveyor or party chief on all PND survey projects since joining the firm in January 1994. *Judy Dougherty, Knik Arm Crossing Project, 907-269-6679; Gerald Jennings, Alaska DNR Division of Land Cadastral Surveys, 907-269-8516; Marc Van Dongen, Port Director, Port MacKenzie, Matanuska-Susitna Borough, 907-746-7414.*

**SUSAN BELL**
B.A. Liberal Arts

**Public Involvement**

Principal Susan Bell brings to this project relevant extensive experience including public outreach and involvement, infrastructure development and market analysis. She has been with McDowell Group 10 years and has worked closely with PND on a number of port and waterfront projects. She recently rejoined McDowell Group after serving as Commissioner of the Alaska Department of Commerce, Community and Economic Development. Susan's public involvement experience includes coordinating household surveys and meetings with the public, tribal governments, local governments, and ANCSA corporations for the Northern Panhandle Transportation Plan and Sitka Access EIS Scoping. She coordinated public meetings during the scoping phase and final round of public meetings for the Juneau Access Supplemental EIS. Susan led McDowell Group's efforts on stakeholder and public involvement for the Juneau Long Range Waterfront Plan, the Downtown Juneau Tourism Transportation Study, and the North Douglas Crossing Public Involvement Study. *References: Diane Kinney, Ports & Harbor Director City of Valdez, 907-835-4564; Larry Gaffaney, Huna Totem President & CEO, 907-523-3671.*

**BEN HAIGHT, P.E.**
B.S. Electrical Engineering

**Electrical Design**
AK EE # 4800

Mr. Haight founded Haight & Associates originally in 1980 as BC Haight, Consulting Engineers. He has over 42 years of electrical engineering experience, and has been practicing in Alaska since 1975. As the principal of the firm, he provides technical guidance to his staff and clients, oversees quality assurance of all project work, ensures compliance with contract requirements, and maintains vigilance of project and work schedules. Mr. Haight participates in the design and construction of electrical systems for harbors, docks and marinas, with experience extending for most of his career. Projects have involved lighting, power distribution, security cameras, metering, grounding and various shore power configurations. He has extensive experience in Southeast Alaska including the Haines Port Chilkoot Dock, Juneau South Franklin Cruise Ship Dock Shore-Power, Ketchikan Berth III and the Juneau Statter Harbor Fuel Dock. *References: Kirk Miller, P.E., AKDOT&PF, 907-465-1215; Jim Beckham, VP Operations, Seward Petro Marine Bulk Plant, 907-224-3190; Steve Corporon, Ketchikan Ports & Harbors Director, 907-228-5632.*

## 2. PAST PERFORMANCE — 15 POINTS

PND is familiar with the Lutak Dock having conducted structural assessments of the dock, bathymetric surveys and designed numerous dock repairs. We have previously developed recommendations for repair and replacement, including preliminary concepts with cost estimates. PND has additionally completed many projects for the Haines Borough and numerous similar projects throughout Southeast Alaska. PND's team has the experience and will be prepared to develop the concepts based on the wants and needs conveyed by the Borough and the Haines community.

### Port Chilkoot Dock Renovation — Haines, AK

The Port Chilkoot Dock located on the waterfront near Fort Seward, provides moorage for visiting cruise ships, small ferries and tour boats. These smaller vessels utilize a lightering float accessed by a gangway at the end of the trestle. The facility, with the exception of the cruise ship dock, had far exceeded its useful life and severe deterioration of the timber structure compromised the safety of visitors and the general public. PND was retained by the Haines Borough to design and administer the construction of the pile supported trestle replacement and lighting facility for this dock.

PND provided surveying, permitting, geotechnical, design and construction administration and inspection services for the Port Chilkoot Dock Renovations project. The existing timber trestle and deck were replaced with a wider steel pipe pile-supported timber trestle and approach dock. The existing approach dock was re-graded to eliminate transitional ramps. A longer and wider covered gangway was installed and the lightering float was modified to accommodate the additional weight. New domestic water and electrical systems were also installed throughout the limits of the improvements.

### Lutak Dock Structural Assessment — Haines, AK

PND performed a forensic structural assessment in 2014 to determine the probable remaining service life of the Lutak Dock in Haines. The 1,100-foot dock is shared by Haines Borough and the Alaska Marine Highway ferry facilities. PND reviewed existing documentation for maintenance and repairs and provided a detailed report to the Haines Borough documenting the results. Work included a review of geotechnical conditions; usage and loading; and environmental conditions including seismic parameters. PND also assessed an underwater condition inspection performed as part of these services. PND provided an analysis comparing the bulkhead structure against the current industry standard for the design of closed-cell bulkheads. The structural analysis included interlock tension, vertical shear, horizontal shear/tilting, and liquefaction analysis, in accordance with current USACE practices and concluded that the facility was near the end of its service life.

## Port of Juneau Cruise Ship Berths — Juneau, AK

**"From planning and environmental documentation to engineering design to construction administration, PND has delivered timely, cost effective services to the City and Borough of Juneau"**
**-Carl Uchytil, P.E.**

Completed overview of concrete pontoon, restraint dolphin and access bridge.

Concrete Pontoon Fabrication at the Concrete Technology Corporation in Tacoma, WA.

The CBJ Docks and Harbors Department contracted with PND Engineers to design two new berths to accommodate post Panamax cruise ships and the first berth was successfully completed in May 2016. PND provided planning, public involvement, surveying, geotechnical investigations, permitting, final design, contract administration and construction inspection services for this multi-phased waterfront project in Juneau.

Extensive planning and geotechnical investigations were conducted to determine the optimum layout abased on existing site conditions. The planning included an intensive public involvement phase to address a number of concerns from users and the public. During this planning phase, the alignment of the cruise ship berths was rotated away from shore into water depths of 100 feet and a 400-foot-long navigation boom was added to alleviate concerns of fishing boats accessing a local seafood processor.

The project required a phased construction sequence over two years due to limited construction time between cruise seasons. The first phase of the project, the South Berth, included a 300-foot by 50-foot concrete pontoon constructed by Concrete Technology in Tacoma, WA and towed to Juneau by the contractor, Manson Construction. The south berth includes seven mooring and breasting dolphins utilizing a combination of rock anchors and SPIN FIN™ piles. The concrete pontoon is accessed by a 140-foot-long orthotropic steel bridge, from a timber-framed approach dock. In addition to providing vehicle access, the bridge has a separate, covered area for pedestrians. A 200-foot by 16-foot concrete mooring float and 120-foot-long covered aluminum gangway were also installed with access to the approach dock. The south berth was completed a week ahead of schedule, well under budget, and with change orders less than 0.5% of the bid amount, representing a remarkable achievement.

The North Berth, beginning in September 2016, will consist of a 400-foot by 50-foot concrete pontoon, 6 additional mooring and breasting dolphins, an approach dock, and a vehicle and pedestrian access bridge. The North and South Berths will be interconnected with catwalks between the dolphins.

## Berths I & II Condition Assessment and Rehabilitation — Ketchikan, AK

PND designed the rehabilitation of approximately 75,000 square feet of existing timber dock located on the waterfront in historic down-town Ketchikan. PND designed a steel pile supported dock with a concrete deck to replace the timber dock and obtained all permits for the project. PND was responsible for project management, geotechnical assessment, surveying, permitting support, civil and structural design, bid support, and construction administration. The dock rehabilitation was completed in 2013.

With the aid of Echelon Engineering for underwater inspection, PND initially performed several yearly condition assessments of all timber elements of the dock, including a dive survey of all 1,200 piles. As a result of the assessments, it was determined that immediate repairs would be required to maintain restricted load limits.

## Chenega and Tatitlek Multi-Purpose Docks — Prince William Sound


Chenega Dock

PND designed two new oil spill response facilities in Prince William Sound with funding resulting from the Exxon Valdez oil spill settlement. The facilities' main function is to provide staging for emergency response measures required to protect the pristine Prince William Sound from oil spills. The facilities, located at Chenega and Tatitlek, were also designed to provide ferry service and freight handling for these remote communities.

The Chenega facility provided an L-shaped pile supported dock with 300-foot face and adjacent two-stage fixed ferry ramp as the principal work. Additional construction included demolition of existing structures, petroleum contamination cleanup, an access road, large rock cuts, one-acre staging area, lighting and water system. The project was constructed in two phases.

The Tatitlek facility provided a 1,100-foot pier with adjacent two-stage fixed ferry ramp as the principal work. Additional construction included an access road, staging area, and lighting. Change orders due to design considerations were less than 1% for the combined projects.

In addition to the design work, PND provided field surveys, right-of-way surveys, and geotechnical investigations. During construction, PND also provided field inspection to aid ADOT&PF onsite during critical phases.


Tatitlek Dock

Items of particular interest regarding these projects include:

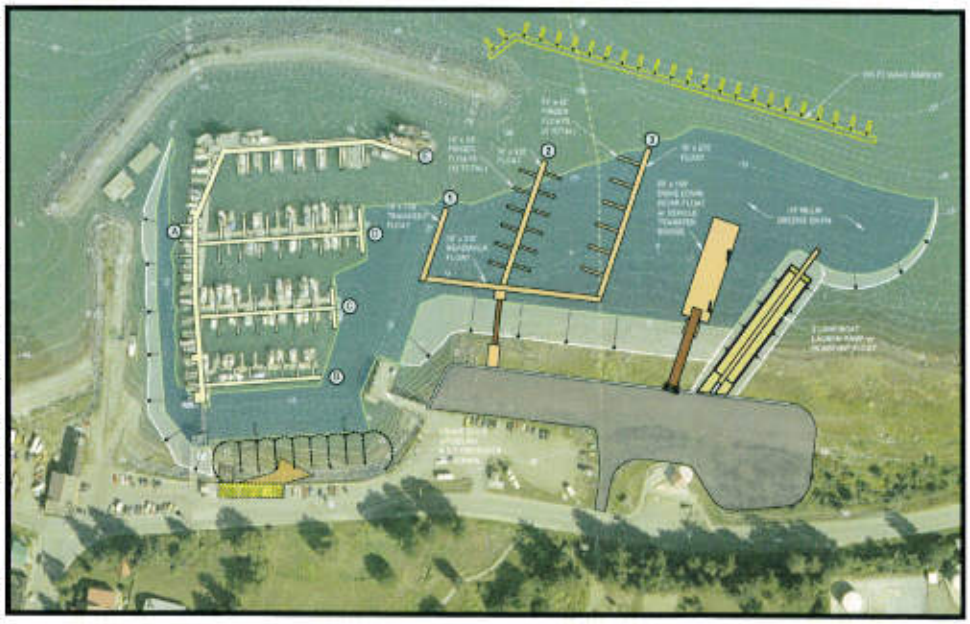
- Seismic rock acceleration used for the design of both facilities was 0.58g, which is considerably higher than most locations throughout the world.
- Both sites had minimal overburden which required extensive use of rock anchors to attach the pile-supported dock to bedrock to resist lateral loads.
- The selection of the Tatitlek dock site involved extensive research and field interpretation of the minimal amount of available historical data and personal observations to determine wave, wind and current climate.

## Ouzinkie Multipurpose Port Terminal — Ouzinkie, AK

PND was contracted by the City of Ouzinkie to plan and develop a multipurpose port facility to replace an existing timber dock for ferry service. Initial discussions about how Ouzinkie could improve its economy and better handle its fishing fleet and material shipments resulted in a new bulkhead design. Elements included: 335-foot-long sheet pile bulkhead, fuel system, sewer outfall, armor rock shore protection revetment and a public boat launch. PND also assisted by providing the Ouzinkie with plans and estimates that were submitted to various government agencies for funding grants, as well as with grant management and accounting services. PND performed full construction administration for this project, including writing of specifications, and continuous onsite inspection throughout construction. Construction was completed in April 2012 at a total cost of $10.1 million.

## Portage Cove Harbor Expansion — Haines, AK

PND was retained by the Haines Borough to provide design, coastal engineering, permitting and geotechnical engineering for the Portage Cove Harbor (PCH) Expansion Project. PCH is the only protected harbor servicing Haines. The Haines community depends on its harbor. This project will help the community keep up with current and projected demands. The PCH expansion will decrease congestion, increase navigability, protect the harbor from excessive wave action and provide uplands access to moored vehicles and expand available loading, parking and boat trailer storage space.



Planning for the harbor expansion includes a boat launch ramp, drive down work float, expanded moorage, relocated park and memorial, seaplane float and uplands parking expansion. PND developed fourteen concepts for the harbor expansion and presented them at a series of public meetings in Haines. The plan approved by the Borough Assembly has been designed and the project is scheduled to begin construction Fall 2016.

## Kodiak Pier 3 Replacement — Kodiak, AK

PND Engineers, Inc. was retained by the City of Kodiak to design a replacement to Pier 3, a container terminal serving the community. The existing structure was at the end of its useful life and required replacement. PND performed an analysis of the existing facility; provided master planning services to review options; performed concept engineering; conducted geotechnical and metocean studies at the exposed site; examined replacement alternatives; performed detailed design; and provided construction administration and quality assurance support for the project.

The replacement structure is a 330-foot-long pile-supported pier supporting a modern 100-foot gauge container crane. Soils at the site are a deep layer of very soft soils requiring piles to be socketed into bedrock. The structure was designed to accommodate large container handling forklifts with 100-ton axle loads. The lateral resistance system utilizes an innovative sheet pile system to drag lateral loads into the fill behind the dock structure. Dolphin structures extend the dock to more than 600 feet.

## Port MacKenzie Development — Matanuska-Susitna Borough, Alaska

PND has completed close to 25 projects over the years at Port MacKenzie, beginning with a deep-water port study, followed by transportation corridor studies and development planning, which provided the foundation for design and construction of the dock for the Matanuska-Susitna Borough (MSB. The port provides 1,800 acres for continuing development of industrial and commercial lands, and adjacent lands provide more than 7,000 acres for residential and commercial development. Port MacKenzie dock design incorporated PND's patented OPEN CELL SHEET PILE™ technology in a challenging environment. Extreme tidal fluctuations, dense soils and severe ice impacts had to be considered in the design. The barge dock was permitted, designed and constructed in approximately six months.

A deep-draft pile-supported barge dock was added to accommodate larger oceangoing vessels with drafts up to 40 feet. The deep draft dock design included a 100-foot by 100-foot equipment loading platform.

PND's familiarity with the site and background on area conditions enabled us to economize on the amount of engineering and production work required for subsequent projects, helping to reduce scopes, schedules and fees. Other projects for the MSB included design of an access road, infrastructure improvements, barge dock expansion, condition inspections and offloader modifications.

Since construction of the original dock, PND has also completed a number of projects in the vicinity for private clients utilizing the Port MacKenzie area. Currently, PND is providing concept development and permitting for expansion of the Port MacKenzie development, which would add a container-handling roll-off facility to the north of the existing facility.

## Seward Railroad Dock — Seward, AK

This project involved design of a new 630-foot sheet pile bulkhead freight dock. PND provided geotechnical investigations, bathymetric and uplands survey, permitting, design, construction administration, and as-builts. The $6 million dock incorporates PND's strong but economical OPEN CELL™ system technology. The soil-filled structures are founded on a skeleton of interlocked and anchored steel sheet piles that are driven into the seafloor. Vibracompaction of the base material on the seafloor and subsequent layers of fill stabilize the complete structure. The dock was designed to accommodate two sets of railroad tracks at the dock face to facilitate direct loading and unloading activities. The work consisted of dredging 220,000 cubic yards along the dock face, 130,000 cubic yards of dock fill, sheet pile, fenders, utilities, and high-mast lights.

The dock serves the Alaska Railroad for freight, tour ships and other uses. This project was funded in part by cruise lines, which advanced $1.1 million for upgrades to the Alaska Railroad passenger terminal and dock.

**Project Understanding**

The Lutak Dock is nearing the end of its useful service life and requires significant refurbishment or replacement to continue serving the Haines community in its current capacity or for anticipated future port operations. Constructed in 1953 by the USACE the dock originally consisted of 15 individual closed sheet pile cells, each approximately 64 feet in diameter, with closure arcs between the cells to make up a total length of about 1100 feet. The Haines Borough owns the westerly 800-foot portion of the dock and the state of Alaska owns and operates the Marine Highway Ferry Terminal on the easterly 300 feet. Severe corrosion and deterioration of the closure arcs led to major repairs by the Borough in 2003. The State removed five of the easterly cells and a portion of cell six as part of their Ferry Terminal Improvements project earlier this year. PND has recently met with DOT&PF engineers involved with their project to understand the difficult demolition operations required for cell removal as well as the running sand conditions encountered during excavation and armor rock placement.

This project is to fully engage the public and facility stakeholders in the development of at least three conceptual design alternatives with associated cost estimates and risk analyses for each. The Borough has previously researched the long term port development potential for Haines in a 2012 study prepared by Northern Economics from Anchorage. Prior assessments, including the *Yukon Port Access Study* prepared by KPMG/Gartner Lee for the Yukon Government, have also researched potential port strategies and economic feasibility in the region including Haines. PND will draw upon these past studies and reach out to the Haines community in the development of sound and practical concept designs that meet current and projected needs. Each concept design will be assessed on several merits including:

- Securing the integrity of the existing facility
- Maintaining existing functional work areas including roll on–roll off operations at the west end
- Expandability of the proposed facility to meet future demand and new business
- Maximizing life expectancy
- Interference with existing AMHS, AML and Delta Western operations
- Cost effectiveness

**Project Methodologies that define our Approach**

PND believes the best approach to completing this project is to create a comprehensive engineering and public outreach program with several sequential tasks as outlined below.

**DATA GATHERING**

**Use of Existing Economic and Engineering Studies:** PND and McDowell will summarize recommendations and conclusions reached from the data base of extensive prior port economic studies. The study information will be confirmed with contacts to project stakeholders and governing agencies to verify current need and projected demand. PND authored the 2014 condition assessment and structural analyses on the Lutak Dock and we are thus completely familiar with the technical engineering aspects of this facility. Our team can proceed immediately without the compensation otherwise required to get up to speed with a condition and needs assessment.

**Surveying and Base Map Preparation:** PND has recently collected bathymetric survey data offshore of the Lutak Dock and extending several hundred feet west of the site, fully suitable for evaluating future expansion options. Further, we have previously collected upland topographic information from DOT&F, USACE and others that will be merged with the bathymetry to prepare a cost effective site base map to be used in the development of conceptual planning options. We will utilize our available data and thus do not envision the need to collect any additional field survey information, thus saving that expense for the Borough. However, we are prepared to collect additional information should the need arise.

**Geotechnical Information:** As part of PND's 2014 condition assessment, we gathered and assessed several geotechnical, geophysical and environmental dredge investigation reports on Lutak Dock. These reports provide a wealth of soils and bedrock data seaward of the dock and within the existing cellular sheet pile structures. The available information is well understood by PND and is considered suitable for conducting the conceptual design phase for this project. Reports within our in house library include:

1953 USACE Haines Port Expansion Asbuilts
1983 ADOT&PF Geotechnical Report – Haines Ferry Terminal
2002 Shannon & Wilson Geotechnical Report – Lutak Dock Improvements
2005 ADOT&PF Geology Data Report – Haines Terminal Improvements
2008 Dynamic Testing and Analysis of Piles – Haines Ferry Terminal Improvements
2010 Dredge Material Characterization Report – Haines Ferry Terminal Expansion

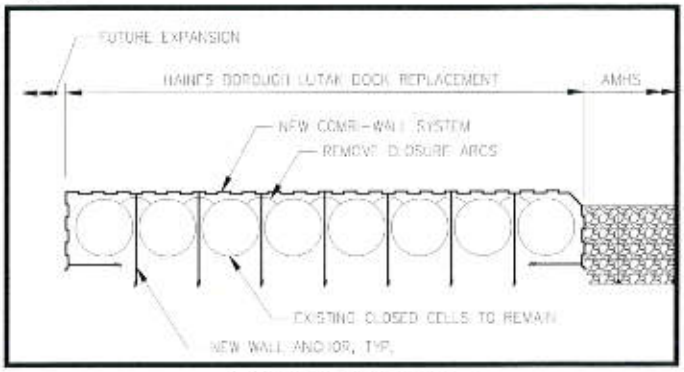
Lutak Dock

Due to our extensive prior work at Lutak, PND has a solid understanding of the soil and bedrock conditions at the site and will not need to collect additional data or spend considerable engineering budget getting acquainted with the site conditions.

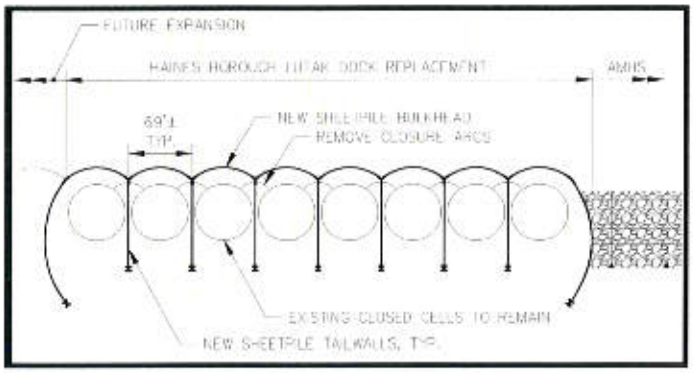
## ALTERNATIVES EVALUATION

PND will prepare the three conceptual design options and associated cost estimates as outlined in the RFP. We will also prepare sub-options under each major concept that illustrate how each may be implemented in phases and additionally how each may be constructed under a base bid with additive alternates to allow the Borough some flexibility in project funding. Further, we will evaluate both pile supported docks and sheet pile bulkhead docks as independent alternatives for each main concept where applicable. Each option will be carefully examined with the AMHS and current tenants and operators of the dock to plan any proposed development around existing operations in an effort to avoid or minimize the disruption of existing commerce and maritime service. Each option will include appropriate corrosion control features in the design to adequately protect the new facility to maximize the life expectancy.

Concept Design Option No. 1 will focus on designing a new structure that fully encapsulates the existing cellular structures and keeps the overall dock size and operational functionality the same as currently exists. At least two potential sub options will be evaluated and they include a tied-back or anchored COMBI-WALL System and an OPEN CELL SHEET PILE™ system.




**COMBI-WALL System**




**OPEN CELL SHEET PILE™ System**

Concept Design Option No. 2 will focus on demolishing the existing cellular structures and designing a new structure that keeps the overall dock size and operational functionality the same as currently exists. There are numerous sub options possible for Concept No. 2 including heavy earth filled marine retaining walls, similar to Option No. 1, as well as pile supported docks. PND will examine both dock types to determine the costs and benefits of each. We have found that OPEN CELL™ docks are typically 40% less costly than comparable size pile supported docks – see Appendix B.

Concept Design Option No. 3 will provide PND's recommendations for the facility. It will draw from the most favorable and cost effective elements of the first two options in combination with other possible earthwork and structural elements to develop a best value approach to completing the project.

## PUBLIC INVOLVEMENT PROCESS

It is of paramount importance that the community be heard and responded to during the development of this important project. The McDowell Group is well known for their market based research, public meeting and project facilitation services and will join PND in the public involvement phase of the project. Our team is uniquely qualified to collect and synthesize public input and stakeholder information needed to optimize the Lutak Dock design and development concepts. McDowell brings an in-depth understanding of economic drivers in Alaska and the Yukon. They have demonstrated success capturing needed information from industrial port users and community members.

**Stakeholder Interviews:** Our team will conduct a series of interviews with stakeholders including community officials, AMHS, adjacent property owners and current and prospective dock users. We will seek input regarding business opportunities and design implications for Lutak Dock. More broadly, we will solicit insights on ways Haines can utilize its port infrastructure to facilitate economic development in the region and state.

As approved by the Borough, key contacts will include representatives from the following:

- Major industry sectors including oil and gas, mining, forest products and seafood.
- Commercial shippers and AMHS.
- Alaska and Yukon government officials engaged with resource and economic development, transportation and military affairs.

**Community Outreach:** The project team will conduct a series of three public meetings to present the design concepts and capture feedback needed to make refinements. We will coordinate in advance with the Borough on meeting dates, time, format, location and public notice. We will enhance public understanding of the options through maps, preliminary designs and informational boards. Presentations and project images will also be available for the Borough's website.

Our experienced team will ensure that public meetings are professionally facilitated and reflect well on the project and the Borough. We will enhance the value of our travel time and cost by meeting with Borough staff, key community contacts and local media as appropriate.

Public feedback gathered during the three meetings will be incorporated into the final design alternative and project reports. The final conceptual design will be presented to the Borough at a fourth public meeting. We will work with the Borough to determine the optimal format for this final meeting. It could be a work session between the Assembly and the Ports and Harbors Advisory Committee, a presentation incorporated into a Borough Assembly meeting, or a stand-alone public meeting.

**MANAGEMENT STRATEGY KEY POINTS**

**LISTEN to the Borough and potential users to thoroughly define the project parameters;**

**Produce only the highest QUALITY products and deliverables;**

**Maintain open and direct lines of COMMUNICATION with the Borough;**

**Document all professional and legal RESPONSIBILITY to the Borough;**

**And fully SUPPORT the Borough in recognizing that unforeseen assistance may be required.**

## FUNDING ASSISTANCE

As a former State Commissioner of DCCED and AIDEA board member, Susan Bell has extensive experience in identifying grant and loan opportunities for economic development projects such as Lutak Dock. Likewise, PND has assisted many Southeast communities with acquiring state and federal grants for their port and harbor projects. Collectively we have had considerable success with the U.S. Department of Commerce Economic Development Administration, Denali Commission, Homeland Security, AIDEA and U.S. Transportation Investment Generating Economic Recovery (TIGER) grant program, to name a few. We wish to share our past experiences with the Borough to assist in securing the funds necessary for reconstructing this vital port infrastructure.

## ENVIRONMENTAL PERMITS

Following selection of a preferred alternative, PND will identify local, state and federal permits required to construct the improvements along with any foreseeable environmental studies and potential mitigation measures that may be necessary.

## RESEARCH AND DEVELOPMENT

**OPEN CELL™ Dock on the Mississippi River (Photo courtesy of Forcum Lannom Contractors)**

In the early 1980s PND's founders developed two technologies that revolutionized their niche in marine and civil engineering – the OPEN CELL SHEET PILE™ structure and SPIN FIN™ piles. The OPEN CELL™ system is a retaining wall bulkhead that can withstand most sediment and environmental conditions, often at a greatly reduced cost compared to traditional wall and pile supported structure designs. SPIN FIN piles are steel pipe piles fitted with unique "fins" that allow the pile to anchor itself into the ground, providing superior tension and compression capacity. PND holds patents on the OPEN CELL SHEET PILE™ system: U.S. Patent No. 6,715,964; U.S. Patent No. 7,018,141; U.S. Patent No. 7,488,140; and U.S. Patent Application No. 12/879,997.

PND's in-house researchers have also developed the technology for partially penetrating wave barriers, allowing less in-water friction, which increases the circulation of water and sediments around a harbor as well as encourages the movement of sea life.

PND regularly investigates and tests a variety of innovative designs to provide our clients with cost-effective solutions and to expand our market. These designs are provided to our clients with no royalties or stipends attached to their use. Our research also includes: ice mechanics, ice breaking and resisting structures; floating wave attenuators; permafrost research for improvements of roads and foundations; pile driving noise attenuation in water; and marine and sediment filtration. We also continue to improve on our OPEN CELL™ and SPIN FIN™ technologies.

**SPIN FIN™ Pile**

A more extensive permitting process can be expected for any dredging and fill options. PND will discuss the project scope with state and federal regulatory agencies as well as local Borough officials and will prepare a list of the permit applications required and the expected time frames for regulatory review and authorization.

### FINAL RECOMMENDATIONS

Our team will prepare a written report summarizing the concepts considered, public involvement process, estimated costs, permitting requirements, potential funding options and final alternative recommendations to carry forward to final design and permitting.

### PROPOSED SCHEDULE

Our team will work with the Borough to fit the public involvement process and completion of this project in with other scheduled community meetings. Assuming the Borough wishes to schedule each of the four public meetings a month apart, we propose the following preliminary completion schedule subject to Borough review. We are fully capable of accelerating this schedule if so desired by the Borough and can be easily completed within half the time indicated if the meeting schedules are compressed to two weeks apart. Similarly, we can extend the schedule if that works better for the community.

| Staff Availability by Quarter (% Time Available for New Work) | |
|---|---|
| **Task** | **Time Allowed (Preliminary)** |
| 1. Contract Negotiations and NTP | 15 days following selection |
| 2. Prepare Basemap and Public Input Meeting No. 1 | 30 days following NTP |
| 3. Prepare 3 Concept Design Options and Public Input Meeting No. 2 | 30 days following Task 2 |
| 4. Concept Refinement and Public Meeting No. 3 | 30 days following Task 3 |
| 5. Presentation of Preferred Alternative and Public Mtg. No. 4 | 30 days following Task 4 |
| 6. Final Report | 15 days following Task 5 |

### PROPOSED BUDGET

PND believes the Borough's stated budget of $100,000-$130,000 is adequate to complete the scope of services outlined. We suggest you contact our references to confirm PND's ability to deliver on time and on budget time after time.

## 4. CAPCITY OF FIRM — 10 POINTS

PND has ample professional and physical resources to provide the services under this contract within the proposed schedule and we have the flexibility to accommodate an accelerated schedule if needed by the Haines Borough. The timing for the project could not be better for our team. While PND does have ongoing workload we are wrapping up our major design commitments and are searching for additional work to keep our staff utilized at efficient levels. Due to recent declines in Alaska's economy, PND has experienced a decrease in design contracts over the past year. As a result, our current design backlog and our one year outlook volume is lower than normal. PND is readily available for this project as can be seen below.

| Staff Availability by Quarter (% Time Available for New Work) | | | | | | | |
|---|---|---|---|---|---|---|---|
| | **Dick Somerville** | **Mike Huggins** | **Rian Johnson** | **Steven Halcomb** | **Maynard Taylor** | **Susan Bell** | **Ben Haight** |
| **Quarter 4, 2016** | 50% | 50% | 60% | 50% | 70% | 40% | 30% |
| **Quarter 1, 2017** | 50% | 60% | 60% | 60% | 80% | 50% | 40% |
| **Quarter 2, 2017** | 60% | 60% | 60% | 70% | 80% | 60% | 50% |

PND's resources include modern administrative systems and communications equipment. All team members utilize compatible programs and software to ensure the seamless interchange of information in any preferred format. Computer resources include Microsoft Office, AutoCAD, Civil 3D, Microstation, Autoturn, 3D Studio, Arcview and Arcinfo along with numerous structural programs. We have integrated state-of-the-art Geographic Information Systems (GIS) technology into our engineering and drafting production to provide comprehensive digital solutions. We can produce hard copy products on virtually any media and any size.

## 5. FIRM'S EXPERIENCE WITH PUBLIC MEETINGS AND USER GROUPS — 10 POINTS

The RFP indicates that a significant amount of public involvement is necessary throughout the concept design process and PND is fully supportive of this approach. We have included the McDowell Group on our team specifically to enhance the public involvement process. Community satisfaction with the development of this project can best be realized by involving the public early in the process. This requires not only listening to the needs expressed at meetings but the experience and enthusiasm to present responsive solutions that function properly and stand the test of time. The scoping and concept development phase of any project is often subject to public scrutiny however it is also the best time to consider design input since changes are less costly than when advanced further into the design process. We often find that local residents, facility users, operators, lease tenants and stakeholders have ideas or opinions that are extremely beneficial to the design process and allowing people to be heard is the key to ensuring that the community is satisfied with the end product.

PND and McDowell have considerable experience with public involvement meetings throughout Southeast Alaska and will enthusiastically conduct public meetings, interface individually with stakeholders, field questions and address comments. Public involvement is an ongoing process that evolves with the development stages through scoping and concept design. During the scoping phase PND will host a minimum of three public meetings soliciting public input on the three conceptual designs. For each of these meetings we will prepare a presentation and solicit public input on the developed options and their associated costs. Informational handouts and comment sheets will be provided at each public meeting allowing written input to be gathered at the meeting or to be mailed in to the Borough. Notes will be taken at each meeting to summarize verbal comments and ideas from those not wishing to write them down and all comments will be summarized in a written brief to the Borough following each meeting. Following the selection of one of the three preliminary concepts PND will develop a final conceptual design incorporating feedback from the public and the Borough. A final public meeting will be hosted for the Borough Assembly to obtain additional feedback on the final conceptual design.

Keeping the public informed and involved from the outset of the planning phases is critical to a smooth implementation of the design. PND and McDowell will meet with the Haines Borough immediately upon award to finalize the scheduling of meetings around affected community stakeholders, boards, commissions and assemblies.

### Above and Beyond in Public Involvement

**PND is highly qualified when it comes to public involvement. From passing out cards to citizens to fielding phone calls to renting meeting halls and putting on a coordinated presentation, PND will engage Haines' public with professionalism and enthusiasm.**

**Members of the Juneau public view large format color concept drawings prepared by PND at an open house style public meeting. The Public was invited to view drawings and ask questions of Owners and Engineers on an individual basis following a presentation by PND.**

**Principal-in-Charge Dick Somerville discussing a design concept with an interested member of the public at a public meeting in Juneau.**

**PND contracted artist Lynn Shimamoto to produce this color artistic rendering used in a recent Juneau public presentation to help illustrate conceptual designs.**

P N D
ENGINEERS, INC.

# APPENDIX A

## Resumes

# DICK SOMERVILLE, P.E. | VICE PRESIDENT

**Project Role: PND Principal-In-Charge - Waterfront Engineer**

PND ENGINEERS, INC.

Mr. Somerville has 35 years of civil engineering and project management experience in Alaska. His background includes planning, permitting, site investigations, design, construction inspection and contract administration for a variety of public and private clients focusing on ports, harbors and waterfront projects. Following five years of employment with Alaska DOT&PF, Dick has worked in the private sector since 1980 and joined PND in 1987. Mr. Somerville is a principal of the firm and the manager of PND's Juneau Office, where he currently manages a staff of 18 engineers and technicians.

Mr. Somerville's engineering experience has included planning, design and construction projects. Projects have included large earthworks, erosion control, water and sewer utility projects, dredging, bridges, docks, cranes, moorage floats, boat launch facilities, marine haulouts, breasting dolphins, retaining walls, sheet pile structures, harbor infrastructure, roadways, parking, staging and work yards. As a planning and design manager he has conducted public presentations, developed needs assessments, scoping studies, condition assessments, produced civil and marine facility designs, technical specifications, contract documents, permits and cost estimates on several hundred public and private projects in Alaska, including the following:

## EDUCATION

B.S. Civil Engineering, University of Alaska Anchorage

## REGISTRATION

Professional Civil Engineer: Alaska #8845

## REFERENCES

Carl Uchytil, P.E., CBJ Port Director, 907.586.0294

Glorianne Wollen, Petersburg Harbormaster 907.772.4688

Greg Meissner, Wrangell Harbormaster 907.847.3736

*Port Chilkoot Dock*

*Petersburg Bulkhead Loading Dock*

## SELECTED RELEVANT PROJECT EXPERIENCE

**Lutak Dock Condition Assessment and Structural Analysis, Haines, AK. Principal-in-Charge.** Mr. Somerville was the principal-in-charge for the field condition assessment, dive inspection and forensic structural assessment to determine the probable remaining service life of the Lutak Dock. PND documented the existing conditions of the dock, identifying deficiencies and determining the cause of the loss of fill and sinkholes. The work included a review of geotechnical conditions; usage and loading; and environmental conditions, including water surface elevation and seismic parameters. PND concluded that the bulkhead does not meet required factors of safety for normal operating conditions and cannot withstand a design-level earthquake.

**Port Chilkoot Cruise Ship Dock, Haines, AK. Principal-in-Charge/Project Manager.** Mr. Somerville was the principal-in-charge and project manager for two recent projects at the Haines Port Chilkoot Cruise Ship Dock. The first project developed a marine seawall, waterfront uplands, shore protection, staging, bus parking and circularion, pedestrian seawalk, restroom, landscaping and utilities. Phase 2 included replacement of a timber decked, steel pile supported access pier leading to an existing cruise ship dock previously designed by PND. The 25' x 800' pier included a new 125' covered pedestrian access gangway leading to a large transient moorage float for day tour boat and ferry transportation operations.

**Letnikof Cove Harbor Refurbishment, Haines, AK. Principal-in-Charge.** Mr. Somerville was the principal-in-charge for the recent refurbishment of Letnikof Cove Harbor. Improvements included a refurbished deck, cleats and bullrails on and existing pipe float; replacement of anchor chains, new gangway, gangway landing float, float extension and installation of pile anodes. He managed permitting, final design, bid phase services along with contract administration and construction inspection.

**Portage Cove Harbor Expansion, Haines, AK. Principal-in-Charge/Project Manager.** Mr. Somerville is the principal-in-charge and project manager under contract with the Haines Borough for the Portage Cove Harbor Expansion project. Improvements include a partially penetrating permeable wave barrier, USACE rubble mound breakwater armor rock, uplands parking and staging, dredging, moorage float piles and sewer outfall line relocation.

**Petersburg Bulkhead Loading Dock, Petersburg, AK. Principal-In-Charge.** Mr. Somerville is the principal-in-charge of planning, permitting, design and contract administration for a new heavy load out dock in Petersburg. The project consists of an OPEN CELL SHEET PILE™ bulkhead, steel and HDPE fender piles, dredging and area lighting.

**Portage Cove Moorage Reconstruction, Haines, AK. Principal-in-Charge/Project Manager.** Mr. Somerville was the project manager and principal-in-charge of this multi-phased harbor project including both uplands and marine facilities. Improvements consisted of replacing the existing moorage system with 27,000 square feet of new treated timber moorage floats, galvanized steel piles, ADA compliant gangways, boat grid rehabilitation, and a new seaplane float. Modern electrical, water services, and a dry fire line system were included. Services included planning, permitting, site investigations, design, cost estimates, bid phase services, contract administration and full time fabrication and construction inspection.

**Haines Street Improvements, Haines, AK. Principal-in-Charge/Project Manager.** Mr. Somerville was the principal-in-charge and project manager of this multi-phased street improvement project over a five year period that completed in 2014. Work includes pavement design, grading and drainage improvements, curb and gutter design, sidewalk designs, asphalt paving, general landscaping, and storm drain systems for sixteen city streets. Services included scoping, site investigations, design, bid phase services, construction administration and onsite inspections services.

**Petersburg Marine Terminal, Petersburg, Alaska. Principal in Charge.** Mr. Somerville was the principal in charge for the Petersburg Marine Terminal. He managed planning, concept design alternatives, cost estimating, public involvement, surveys, geotechnical investigations, environmental studies and permits, design and contract document preparation along with contract administration and construction inspection. The work includes 3 acres of uplands, a sheet pile bulkhead dock, pile supported approach dock, hydraulic cranes, drive down float, transfer bridge, large vessel moorage, dredging and beneficial use of dredge spoils, water, sewer, power, lighting, grading and drainage, all constructed over three contract phases.

**CBJ Cruise Ship Berths, Juneau, AK. Principal-In-Charge.** Mr. Somerville is the principal in charge of the reconfiguration and construction of two new offshore floating pontoon docks in downtown Juneau. The $54 million berths accommodate two cruise ships up to 1,100' in length. Designed facilities include pile supported approach docks, floating concrete pontoons, drive down transfer bridges, mooring and breasting dolphins and other utility infrastructure. The design includes large diameter steel piles anchored into bedrock with water depths over 100'. Mr. Somerville is currently managing all planning, permitting, site investigations, final design, contract administration and construction inspection for the project.

**Letnikof Cove Boarding Float, Haines, AK. Principal-in-Charge/Project Manager.** Mr. Somerville was the principal-in-charge and project manager for a seasonal boarding float at Letnikof Cove Boat Launch Ramp. The project included installation of a segmental 8' x 240' long timber boarding float with galvanized steel piles installed alongside an existing concrete boat launch ramp at Letnikof Cove. Due to wave exposure at this site, the float is intended for seasonal usage only and is thus equipped with detachable pile hoops and hinge connections to ease assembly and disassembly. Services included planning, permitting, design and construction phase services.

# MIKE HUGGINS, P.E. | PRINCIPAL SENIOR ENGINEER

*Project Role:* **Principal Structural Engineer**

PND ENGINEERS, INC.

Mr. Huggins has 28 years of construction-related design experience holding the positions of Chief Engineer, Project Field Engineer, and Estimator in a full range of marine heavy-civil construction. His technical capabilities include design/development and detailed estimating of broad-scope engineering systems, providing technical expertise and constructability review in design-build projects, and managing multi-discipline engineering work. Mr. Huggins served as the Chief Engineer/Senior Construction Engineer and as an Estimator for General Construction Company from 1996 to 2003. Following a year with Tacoma Narrows Constructors, he joined PND and continues to work with national and regional contractors to solve construction engineering problems inherent while building complex marine and bridge structures.

## EDUCATION

University of Washington, M.S., Civil Engineering, 1988
University of Washington; B.S., Civil Engineering, 1985;
Technical University of Denmark, Valle Scholar, Marine Engineering, 1987

## REGISTRATION

Professional Civil Engineer: WA # 26812, 1990; AK #8097, 1990; CA #47424, 1991; OR #14461, 1988; MT #20364, 2011; LA #PE.0037973, 2013; NY #092920-1, 2013.

## REFERENCES

Patrick Clarke, 360.705.7220, WSDOT Floating Bridge & Special Structures Design

Kent Werle, 253.943.4200, Kiewit Bridge and Marine (Hood Canal Floating Bridge, Eastern Half Pontoon Severing Analysis)

Gary Davis, 253.943.4200, Kiewit Bridge and Marine (Wanapum Dam Demolition)

*Tacoma Narrows Bridge Second Crossing*

## SELECTED RELEVANT PROJECT EXPERIENCE

**Lutak Dock Investigation, Haines, AK. Structural Engineer.** Provided structural assessment to determine the probable remaining service life of the Lutak Dock, a closed-cell bulkhead structure in Haines. The 1,100-foot bulkhead was designed by the U.S. Army Corp of Engineers and constructed in 1953. Work included a review of existing documentation for maintenance and repairs and a report documenting the results. Mr. Huggins led a structural analysis comparing the bulkhead structure against the current industry standard for the design of closed cell bulkheads. The analysis included interlock tension, vertical shear, horizontal shear/tilting, and liquefaction analysis.

**PCCP OPEN CELL® Structures, New Orleans, LA. Principal-in-Charge.** Providing engineering services to Stantec Consulting Services, Inc., for the Permanent Canal Closure and Pumping (PCCP) project in New Orleans, a design-build project for the U.S. Army Corps of Engineers. The project includes pump stations, gates, and barrier walls at three canal sites. PND is performing final design and construction support for temporary cofferdams and permanent OPEN CELL wall structures. Work also includes design coordination with the USACE, the contractor, and engineering consultants working on other portions of the project.

**United States Navy Hybrid Pier. Value Engineer/Estimator.** The U.S. Navy is currently developing a prototype floating Hybrid Pier to replace fixed facilities. Working as a sub-consultant to U.S. Cost, Mr. Huggins provided expertise and cost information for the 35% independent cost estimate. Work assigned to PND required pricing and estimating costs for the graving dock and site work for construction of the pier, installation of the seabed hard points to secure the structure, and providing labor/man-hour history for construction of floating pontoon structures. Mr. Huggins was recommended to the U.S Cost team by Navy personnel familiar with his value engineering and estimating work for structures constructed in Puget Sound.

**Design Review, Gulf IntraCoastal Constructors, New Orleans, LA. Structural/Construction Engineer.** Led design review for Gulf IntraCoastal Constructors Joint Venture for construction of the Gulf Intracoastal Waterway West Closure Complex, a $1 billion flood protection facility. This U.S. Army Corps of Engineers (USACE) project included a navigable floodgate, pumping station, floodwalls, sluice gates, foreshore protection, and earthen levee. Led 39 peer reviews for structural design and construction of the project, which was awarded under an Early Contractor Involvement (ECI) contract. The ECI allowed the contractors to work closely with the USACE and design team on plan revisions and construction sequencing to improve constructability and cost-savings.

**La Farge Northwest Plant Bulkhead Replacement, Duwamish Waterway, WA. Principal-in-Charge.** Provided project management and structural engineering services for this break-bulk cement production facility in Seattle, Washington. In early 2006, one of twenty classic circular sheet pile cells at the bulkhead failed without warning, forcing restricted use of the facility. PND utilized detailed soil structure analyses to determine the most efficient alternative to replace and repair the damage cell. A new classic braced wall structure was constructed that is/was composed of heavy zee-sheets, PND's SPIN FIN™ piles, and a heavy waler system. The offshore crane beam was re-supported by driving new piles through large diameter cores.

**Barnard Construction Company / Snoqualmie Falls Power House Reconstruction; Puget Sound Energy, Snoqualmie Falls, Washington. Principal-in-Charge.** The existing Plant 1 and Plant 2 Power House and associated intake and outlet structure(s) are being upgraded to obtain re-licensing under Federal Energy Regulatory Commission rules. Construction engineering for this project intiated with design of a structure to enable dewatering of power house intake and outlet structures, and to providde aclo cess for partial demolition of the existing weir structure. This was achieved using "supersak" sand bag berms, with integration of the Porta-Dam® modular cofferdam system. Supplemental tasks followed for design of an extensive rigid cofferdam to protect the Plant 2 intake concrete work during modest flood events during winter 2010-2011.

**NSWCCD Bremerton Consolidation NAVBASE Kitsap at Bangor, Silverdale, WAP-364, Phase 1 FY05, Value Engineering Study. Value Engineering.** A value engineering study was conducted by the Navy to reduce the construction cost associated with moving the existing acoustic and general naval research facility on the south side of Fox Island, to the base at Bangor. Mr. Huggins was requested by the Navy to participate in the VE study to provide marine construction experience and perspective. The suggestions and ideas generated resulted in approximately $250,000 in savings, resulted from re-alignment of the approach pier into shallower water, eliminating "dog-leg" geometry, simplifying the structural framing plan, and re-arranging the mooring dolphin structures. Alterations to utility routing and streamlining mechanical and electrical chase ways also reduced costs significantly and enhanced maintenance and repair of the systems. His recommendations were incorporated into the design-build documents issued to contractors.

**Pier D Replacement, Design/Build Project, United States Navy, Bremerton, WA, 2000–2002. Construction Engineer.** Construction engineering for this project covered straightforward and complex forming/shoring of cast-in-place concrete and pre/post proposal driving analysis of large diameter pre-stressed concrete foundation piles. Mr. Huggins completed the engineering package to enable pre-casting large 30-foot x 25-foot utilidor sections for the exterior perimeter of the new pier. Segment handling stresses, rigging, casting sequence, and heavy-lift spreader bars were designed to speed construction via offsite casting and transporting/setting the section at the new pier site.

**Marine Structure Design-Build, U.S. Navy and Coast Guard, 1999-2002. Construction Engineer.** Developed an engineering proposal and managed engineering for the first three-design build projects constructed in Puget Sound. All three proposals were successful and led to the construction of a new Pier Facility for the Coast Guard Station at Neah Bay, complete replacement and reconstruction of pier structures and floating structures at Keyport Naval Undersea Warfare Center, and for the recently completed Home Port Pier at Naval Station Puget Sound in Bremerton.

**Caisson Construction Engineering, Tacoma Narrows Constructors, Gig Harbor, Washington. Construction Engineer.** While employed directly by the Tacoma Narrows joint venture, Mr. Huggins prepared the design of a 60' tall sacrificial steel cofferdam that rises from the top of the caisson cutting shoe. Of equal importance was a 2800 kip capacity moveable strut system used to brace the caisson exterior walls at extreme draft conditions prior to touchdown on the seabed. He prepared detailed designs for subsea anchors, temporary false-bottom alternatives, caisson anchor line attachments, and coordinated work with outside design firms. His interaction with Parson Transporration Group in San Francisco enabled rapid resolution of discrete design issues relating to carrying high temporary construction loadings from sea-bed anchor lines.

# RIAN JOHNSON, P.E., S.E. | PRINCIPAL, SENIOR ENGINEER

*Project Role:* **Principal Structural Engineer**

PND ENGINEERS, INC.

Mr. Johnson is a civil and structural engineer specializing in marine construction, design, engineering, and administration. He has 15 years of experience in various areas of the engineering industry, including engineering consulting and public works. His recent work includes project management, on-site construction administration, marine facility design, and utility surveys. Specialized skills include structural analysis and design, weld and pile driving inspection, and contract administration. He has worked on all aspects of engineering for airports, marine ports, harbors, marine facilities, bridges, roadways, utilities, and temporary construction works projects. Mr. Johnson's recent projects have given him extensive working knowledge of applicable design and construction codes, including ASCE, USACE Engineering Manuals, AASHTO, ACI, AWS, and API.

## EDUCATION

B.S. Civil Engineering, University of Washington, 2001
M.S., Civil Engineering, Stanford University, 2008

## REGISTRATION

Civil Engineer: Washington, 2006; Louisiana, 2015
Structural Engineer: Washington, 2015

## REFERENCES

Rob Mullins, 604.587.8400, Stantec Consulting Services (PCCP OPEN CELL Structures)

Ariel Smith, 360.642.4421, City of Long Beach, WA (Long Beach Tsunami Safe Haven Berm)

Shawn Wyatt, 617.890.0600, Cashman Dredging and Marine Contracting Co, LLC (Dockyard Land Reclamation Bulkhead)

*Dockyard Land Reclamation Bulkhead*

## SELECTED RELEVANT PROJECT EXPERIENCE

**Dockyard Land Reclamation Bulkhead, Ireland Island, Bermuda. Project Manager, Principal Structural Engineer.** Leading project team in providing final design and construction support for a new OPEN CELL SHEET PILE™ bulkhead at the Bermuda Royal Navy Dockyard. The 1,345-foot-long bulkhead will form two of the four sides of the new nine-acre reclamation area along with an existing concrete gravity breakwater. The new bulkhead is up to 45 feet tall. He provided a value engineering analysis and realized a substantial cost savings for the Owner utilizing the OPEN CELL SHEET PILE design and a reduction of steel up to 40%. Based on this analysis, the Owner determined that this was the preferred alternative to the original combi-wall design. Mr. Johnson provided final design and construction support through-out the project. The land reclamation area supported by the bulkhead will serve as the spectator and race team upland area for the 2017 America's Cup Sailing Race in Bermuda.

**Long Beach Tsunami Safe Haven Berm, Long Beach, WA. Principal-in-Charge, Principal Structural Engineer.** Providing engineering services for this extreme environmental structure with the City of Long Beach, WA. The berm is designed to protect the Long Beach community during and after a large magnitude Cascadia Subduction Zone earthquake off the coast of Washington. Therefore, the Tsunami Berm must withstand both the initial seismic event, then in a matter of minutes after the shaking subsides, resist the forces from a 15-foot tsunami traveling 26 feet per second. The vertical evacuation berm is the first-of-its-kind structure in North America; once completed this will be a landmark structure able to support more than 850 people for approximately 12 hours.

**PCCP OPEN CELL™ Structures, New Orleans, LA. Discipline Design Lead/Resident Engineer.** Led engineering services provided to Stantec Consulting Services, Inc., for the Permanent Canal Closure and Pumping (PCCP) project in New Orleans, a design-build project for the U.S. Army Corps of Engineers. The overall project included pump stations, gates, and barrier walls at three canal sites. Mr. Johnson managed design and construction support for temporary cofferdams and permanent OPEN CELL wall structures used for flood control. He also provided design coordination with the USACE, the contractor, and design consultants working on other portions of the project.

**LaFarge Northwest Plant Bulkhead Replacement, Duwamish Waterway, WA. Project Manager, Structural Designer.** Provided design project management and structural engineering services for this break-bulk cement production facility in Seattle, Washington. One of twenty closed, circular sheet pile cells failed, restricting use of the facility. Utilizing PND's SPIN FIN™ pile tips, a new braced wall structure composed of heavy z-sheets, and brace piles with a heavy waler system was constructed. The offshore concrete crane beam was re-supported by driving new piles through large diameter cores, and extending the cap atop the brace piles under the existing concrete crane beam. Mr. Johnson worked with PND's project team to provide pile driving inspection, and inspection oversight during welding and steel assembly of the heavy caps and attachments.

**Port of Juneau Cruise Ship Berths, Juneau, AK. Project Engineer.** Provided structural design and analysis for the Port of Juneau's new downtown cruise ship facility (currently in construction). The cruise ship facility will have two large ship berths comprised of large concrete floating pontoons, berthing and mooring dolphins, and transfer bridges for passenger and vehicle access.

**Nanaimo Cruise Terminal, Nanaimo, B.C., Canada. Project Manager.** Mr. Johnson coordinated the structural design effort for the pontoon mooring dolphins, 130-foot vehicle transfer bridge, and 120-foot-long gangway at the cruise terminal. Also assembled the performance specification for the 350-foot by 50-foot floating concrete pontoon dock and the incorporated mooring system. In addition, Mr. Johnson provided construction administration and fabrication oversight of the pontoon, transfer bridge, gangway, and dolphins.

**Ocean Gate Multimodal Terminal, Portland, ME. Structural Designer / Construction Administrator.** Phased improvements to this 16-acre site included an integrated marine terminal and transportation facility that incorporated the infrastructure needs of cruise ships, as well as international ferry service, local ferry service, high-speed ferry service, public and private vessel berthing, and public access. Mr. Johnson provided design for new ferry berthing facilities that included a hydraulically operated transfer bridge and fendering system. Work also included design and construction support for the 1,200-foot Ocean Gateway Pier II and ferry terminal building dock.

**Kitimat Work Trestle, Kitimat, BC, Canada. Project Engineer.** Provided design for dolphins and catwalks for the Barge Facility for Allnorth Consultants Ltd in a design-build project with Ruskin Construction. The design includes six breasting and mooring dolphins with associated catwalks and access stairs from the trestle. The temporary trestle structure will be used for loading barges for ocean disposal of dirt during construction of the Kitimat LNG Export Terminal project in central British Columbia.

**Ketchikan Port Berth III Reconfiguration, Ketchikan, AK. Project Engineer.** Mr. Johnson provided the city of Ketchikan with construction administration, on-site inspection, and construction engineering for the port reconfiguration project during preconstruction and construction phases of the project. Also coordinated in-water sound monitoring efforts during pile driving. Additionally, performed the structural analysis for the 175-ton deep-water mooring dolphins for the city's cruise ship terminal.

**AJ Cruise Ship Dock, Juneau, AK. Structural Designer/Construction Inspector.** Mr. Johnson provided structural design and construction inspection for AJ Dock, a design/build project with ACC Hurlen Construction of Seattle. PND performed design services for the facility, which provides berthing for 1,100-foot cruise ships.

**Railroad Dock South Berth Extension, Skagway, AK. Structural Designer.** Mr. Johnson provided fabrication and construction inspection of a 210-foor dock extension. Worked on-site through 5 months of construction to verify construction conformance to the original project design and specifications. Inspected 54 steel piles driven with both vibratory and impact hammers and also tested welding, concrete casting, and rock anchor installation.

# STEVEN HALCOMB, PE, GE | Senior Geotechnical Engineer

*Project Role:* Geotechnical Engineer

PND ENGINEERS, INC.

Mr. Halcomb has ten years of geotechnical, cold regions, and structural engineering experience through both professional and academic work. He has performed a multitude of geotechnical explorations using a variety of techniques from test pits to macro-coring including standard penetration and cone penetration tests. He has experience designing shallow and deep foundations in ideal and adverse conditions include liquefiable and expansive soils. He has extensive experience in Southeast Alaska, having performed testing for projects in Haines, Juneau, and Prince of Wales Island. He has had a great deal of experience in slope stability and geotechnical earthquake engineering and retaining structures. He is very familiar with codes, regulations and design guides from AASHTO, ASTM, AREMA, API, IBC, NDS, AISC, ACI, NAVFAC, SNiP, UFC, FHWA and ASCE.

## EDUCATION

Doctoral Student, Kansas State University, Ongoing

M.S., Civil Engineering, University of Alaska Anchorage, 2010

Grad Certificate, Earthquake Engineering, University of Alaska Anchorage, 2010

B.S., Civil Engineering, University of Alaska Anchorage, 2008

## REGISTRATION

Civil Engineer, Alaska #12939, 2011

Geotechnical Engineer, California #3072, 2015

## REFERENCES

Javier Fente, ExxonMobil, 832.374.6288

Dana Hayek, Contech Engineered Solutions, 907.223.7348

Leonard Barger, Native Village of Point Hope, 907.368.2330

*Portage Cove Harbor Expansion*

*Statter Harbor Improvements*

## SELECTED RELEVANT PROJECT EXPERIENCE

**Portage Cove Investigation and Alternates Analysis, Haines, AK. Geotechnical Engineer.** Mr. Halcomb provided field support during the offshore geotechnical investigation of South Portage Cove in Haines, AK. Further work included laboratory testing and engineering for the geotechnical report from the exploration. He provided additional analysis to an alternatives report to determine the best choice of engineering infrastructure for the proposed development. The additional analysis included utilizing 2D finite element program Plaxis to model the construction and analyze the stability of the proposed rubble mound breakwater to provide input for the Alternates Analysis comparing various marine solutions to the rubble mound breakwater.

**Juneau Cruise Ship Dock, Juneau, AK. Geotechnical Engineer.** Mr. Halcomb aided in the field exploration support of major offshore exploration for the proposed Juneau Cruise Ship dock expansion. Mr. Halcomb supervised the night exploration which consisted of offshore drilling techniques and standard split-spoon sampling until bedrock was encountered. Drilling then changed to rock coring to obtain additional samples of bedrock. Additional analysis included seismic studies and related hazards of the Juneau area and design parameters for a variety of foundations into bedrock including rock sockets and pin-piles. He provided the geotechnical recommendations for the geotechnical report and provided analysis on liquefaction, lateral spreading, pile foundation and rock socket design.

**Statter Harbor Improvements, Juneau, AK. Geotechnical Engineer.** Mr. Halcomb assisted in the on- and off-shore geotechnical investigation for the Statter Harbor Improvement upgrades in Juneau, AK. Work included aiding in the field exploration followed by overseeing advanced soils testing and writing a geotechnical report with recommendations for building a temporary and permanent embankment over soft, highly compressible clays. Design was completed following the geotechnical report's recommendation that the embankments be built in a drained state including the use of wick drains. Construction is currently underway with an extensive monitoring plan including settlement plates, piezometers, and inclinometer casing.

**Chignik Small Boat Harbor, Chignik Bay, AK. Geotechnical Engineer.** Mr. Halcomb led the offshore exploration program in the small boat harbor in Chignik, AK. Work included borehole location using GPS technology including movement of anchorage system for the barge. Exploration utilized the standard penetration test to assess the subsurface conditions and obtain soil samples. Analysis included development of subsurface profiles for the north and south end of the harbor and soil strength design parameters for the future floats.

**Unalaska Marine Center Geotechnical Investigation, Unalaska, AK. Geotechnical Engineer.** Mr. Halcomb oversaw the on- and offshore drilling operation of nine boreholes for this geotechnical investigation. Work included field logistics and soil sampling to obtain strength characteristics and bedrock elevations to support the design of a new dock in Unalaska.

**Robert Storrs Small Boat Harbor Center Geotechnical Investigation, Unalaska, AK. Geotechnical Engineer.** Mr. Halcomb oversaw the offshore drilling operation of seven boreholes for this geotechnical investigation. Work including field logistics and soil sampling to obtain strength characteristics and bedrock elevations to support the design of new float piles for the existing small boat harbor.

**Kodiak Pier 3 Replacement Project, Kodiak, AK. Geotechnical Engineer.** Mr. Halcomb oversaw the field geotechnical investigation for the on- and offshore exploration for Kodiak Pier 3 Replacement. He oversaw the laboratory testing of the recovered soil and rock samples and wrote a geotechnical data report. From that report he performed a dock alternatives analysis comparing a sheet pile dock to a pile supported dock. This alternatives analysis found a pile supported dock to be the best choice and the design proceeded from there. He further provided geotechnical support, analysis, and recommendations for the complete design of Kodiak Pier 3 Replacement. He has further provided construction support.

**Anton Larsen Bay Floats Replacement, Kodiak, AK. Geotechnical/Marine Engineer.** Mr. Halcomb oversaw the field geotechnical investigation for the offshore exploration for Anton Larsen Bay Floats. He further provided geotechnical support, analysis, and recommendations for the complete design of new floats and float piles.

**OSI Marine Terminal, Unalaska, AK. Geotechnical/Marine Engineer.** Mr. Halcomb is currently leading the geotechnical efforts for a new dock for Knik at the OSI Marine Terminal in Unalaska, AK. He provided guidance for the pile probing and derived data to determine soil strength properties. Bedrock elevations were mapped and the original design was modified to account for shallow bedrock. He performed internal and external global stability for two single, OPEN CELL SHEET PILE™ abutments, evaluated pile capacity for compressive and tensile loads, provided rock anchor design for the dolphin piles where needed, and performed the redesign of the cantilever retaining wall into an anchored bulkhead with deadman.

**Engineering Excavation and Shoring Plans, Anchorage, AK. Geotechnical/Structural Engineer.** Mr. Halcomb has assisted numerous contractors and designers with developing and implementing excavation and shoring plans throughout Alaska. Environments of work have ranged from the North Slope to river channels. Developed plans have followed OSHA and other agencies'/organizations' guidelines for construction, stability, operation, and maintenance.

**Nome Snake River Structural Foundation, Anchorage, AK. Geotechnical Engineer.** Mr. Halcomb contributed to analysis and report of a new foundation for a new bridge over the Snake River in Nome, Alaska. Analysis included pile capacity following AASHTO LRFD Manual for piles driven into rock and rock sockets. Lateral analysis of pile foundations utilizing p-y curves was also performed.

**Laboratory and Field Testing, Anchorage, AK. Geotechnical Engineer.** Mr. Halcomb has performed many laboratory tests following ASTM and AASHTO as needed on both frozen and unfrozen soil samples. Basic indexing testing includes moisture content, specific gravity, sieve and hydrometer, Atterbergs, proctor, and field density using both a nuclear density gauge and rubber balloon device. Secondary testing includes direct shear, tri-axial, and unconfined compression. Additional tests include unit weight from field sampling and thaw strain testing on frozen samples. Field testing has included dynamic cone penetrometer for CBR, percolation testing, pile driving analysis (PDA), vane shear testing, ground temperature readings, and settlement plate monitoring and data reduction.

# MAYNARD TAYLOR, PLS | Senior Land Surveyor

*Project Role:* **Survey Chief**

P | N | D
ENGINEERS, INC.

Mr. Taylor has more than 40 years of surveying experience statewide, encompassing project management; large mapping projects; design surveys; boundary surveys; Alaska Tideland Surveys; hydrographic, photogrammetric control, subdivision, and as-built surveys. He has experience in U.S. Surveys for the Bureau of Land Management, DOT&PF highway construction surveys and construction inspection. He has a working knowledge of the newest survey technology, including electronic Theodolites with data collectors; GPS systems; depth sounders that allow positioning interface to be downloaded with depths via data collector; and the latest CAD software. He has considerable experience on the southeast, having performed projects in Juneau, Ketchikan, Petersburg, Sitka, Skagway, Akun Island, and Prince of Wales Island. He has served as either lead surveyor or party chief on all PND survey projects since joining the firm in January 1994.

## EDUCATION

B.S., Political Science, University of Utah, Salt Lake City, 1973

Post Baccalaureate Studies, Survey Technology, Anchorage

## REGISTRATION

Professional Land Surveyor, Alaska #7624, 1988

## REFERENCES

Judy Dougherty, Knik Arm Crossing Project, 907.269.6679

Gerald Jennings, Alaska DNR Division of Land Cadastral Surveys, 907.269.8516

Marc Van Dongen, Port Director, Port MacKenzie, Matanuska-Susitna Borough, 907.746.7414

*Akutan Airport Hovercraft Ramp*

*Homer Small Boat Harbor*

## SELECTED RELEVANT PROJECT EXPERIENCE

**Shoemaker Harbor, Wrangell, AK. Lead Surveyor/Survey Coordinator.** Mr. Taylor led bathymetry and upland survey for the City of Wrangell in support of marina upgrades. Located existing features within the harbor and performed bathymetry outside of the breakwater for use in designing an additional breakwater and for dredging of a portion of the harbor basin in order to expand the facilities with additional floats. This project also entailed upland survey of the parking area for re-grading, putting in storm drainage, and paving.

**Ketchikan Port Berth Expansion, Ketchikan, AK. Survey Lead.** Mr. Taylor led all survey including extensive hydrographic surveys and single-beam bathymetry survey of the harbor area. Onshore surveys included a design survey of immediate structures along the shoreline. Design survey included horizontal and vertical location of existing upland structures (buildings, parking lots, docks, marinas, floats, roads, curbs, gutters, sidewalks, a tunnel and utilities), as well as utility as-builts. Using this data, a base map was developed for use in design for upgrading and expanding waterfront facilities.

**Thomas Basin Retaining Wall, Ketchikan, AK. Lead Surveyor/Survey Coordinator.** Mr. Taylor led bathymetry for the City and Borough of Ketchikan along the face of the existing sheet pile retaining wall, which is failing, to determine depth in support of PND's design of a replacement sheet pile wall. This project also entailed uplands survey for parking upgrades designed by PND.

**Hole in the Wall, Ketchikan, AK. Lead Surveyor/Survey Coordinator.** Mr. Taylor led bathymetry and uplands survey in support of plans to upgrade the marina.

**Angoon Barge Landing, Angoon, AK. Lead Surveyor/Survey Coordinator.** Mr. Taylor led design surveys, as-built surveys of the existing dock and facilities, and bathymetry survey in support of a project to upgrade the barge landing ramp.

**Adak Small Boat Harbor Extension, Adak, AK. Lead Surveyor.** Mr. Taylor led all survey including bathymetric and upland topographic survey for this project wherein PND designed a 535-foot sheet pile dock, dredging, 37,000± square feet of floats, travel lift, additional dredging and breakwater construction.

**Dillingham Cold Storage All-Tide Dock Upgrade, Dillingham, AK. Survey Lead.** Mr. Taylor led topographic and bathymetric survey services in support of design of the construction of a $6 million dock facility for the City of Dillingham. PND performed final design of the facility, survey, geotechnical engineering, construction administration, and inspection.

**Kodiak Shakmanof Cove Bathymetry, Near Kodiak, AK. Survey Lead.** Mr. Taylor led a hydrographic survey and creation of a base map to aid in the design of a temporary barge dock, permanent bulkhead dock and to locate deep water channels for entering and exiting the Cove and the permitting process. A Record of Survey defining the Mean High Water Line prior to any construction was completed to insure the accurate location of the dividing line between uplands and submerged lands.

**ARRC Seward Dock and Freight Terminal, Seward, AK. Survey Lead.** Mr. Taylor performed bathymetric and upland topographic survey for the design of the sheet pile dock and terminal.

**City of Whittier Small Boat Harbor Improvements Survey, Whittier, AK. Survey Lead.** Mr. Taylor led all survey including hydrographic and uplands design survey. Included bathymetry data collected within the harbor and extending outside of the breakwater. An extensive design survey was conducted around the entire harbor, including the location of the buildings, parking lots, docks, roads, curbs, gutters, sidewalks, utilities, underground utility locates, and as-built of all storm/sewer manholes. A comprehensive base map was then developed for use in the design of the Small Boat Harbor Upgrade.

**Kloosterboer Dutch Harbor Marine Terminal, Dutch Harbor, AK. Survey Lead.** Mr. Taylor performed a barhymetric survey, as-built and boundary survey, property re-plat and lease area legal descriptions; and Alaska Tide Land Survey lease for this 75 million sheet pile dock facility designed by PND Engineers that included uplands development.

**Hoonah Harbor Launch Ramp Hydrographic Survey, Hoonah, AK. Survey Lead.** Mr. Taylor oversaw the hydrographic survey of the area, as well as an upland topographic survey. Care was taken to ensure an overlap of data between the uplands and bathymetry. A base map was produced from this data that was used during the permitting and design phase.

**Bokan Mountain Mine Bathymetry, Prince of Wales Island, AK. Lead Surveyor/Survey Coordinator.** Mr. Taylor led the bathymetric/hydrographic survey operations in support of development of port facilities for the Bokan Mountain mine project.

**Akutan Airport, Akun Island, AK. Lead Surveyor/Survey Coordinator.** Mr. Taylor was lead surveyor, providing topographical survey for this project. Work included obtaining survey data for the airport area and the primary and secondary sites for a hovercraft landing ramp and storage facility and survey of the seaplane base that was originally designed by PND. All surveys were performed on difficult terrain in a remote area that required significant planning and preparation.

**Homer Small Boat Harbor Upgrade, Homer, AK. Lead Surveyor/Survey Coordinator.** Mr. Taylor provided horizontal and vertical control, control traverse, as-builts of utilities, topographic survey in the area of the proposed Homer Spit trail, as well as bathymetric survey in support if this small boat harbor upgrade project.

**Anton Larson Bay, Kodiak, AK. Lead Surveyor/Survey Coordinator.** PND provided surveying services to evaluate float replacement options for the Anton Larsen Bay Public Float Replacement Project. A base map was prepared using 1-foot contours showing both the upland and bathymetric topographic features. The existing Anton Larsen Bay float was observed to be very near the end of its useful life and in need of total replacement.

**Skagway Harbor Improvements, Phase II, Skagway, AK. Lead Surveyor/Survey Coordinator.** Mr. Taylor led complete uplands topographic and offshore bathymetric surveys for design of Phase II harbor improvements. Surveys were performed for a reconfigured boat launch facility, harbor basin expansion, new moorage floats, sheet pile bulkhead, drive down float and pedestrian promenade along the waterfront. Uplands surrounding the harbor were also surveyed to transition marine transportation improvements into the adjacent streets and walkways.

**Skagway Small Boat Harbor Seawalk and Uplands Survey, Skagway, AK. Lead Surveyor/Survey Coordinator.** Mr. Taylor led preconstruction survey for the City of Skagway. Work included production of a topographic survey base map of the area.

**Skagway Railroad Dock Expansion, Skagway, AK. Lead Surveyor/Survey Coordinator.** Mr. Taylor led Alaska Tideland Survey for the Railroad Dock expansion project.

## SUSAN BELL | McDOWELL GROUP PRINCIPAL

**Project Role: Public Involvement**

Principal Susan Bell brings to this project relevant extensive experience including public outreach and involvement, infrastructure development, and market analysis. She has been with McDowell Group 10 years and has worked closely with PND on a number of port and waterfront projects.

Susan's public involvement experience includes coordinating household surveys and meetings with the public, tribal governments, local governments, and ANCSA corporations for the ***Northern Panhandle Transportation Plan*** and ***Sitka Access EIS Scoping***. She coordinated public meetings during the scoping phase and final round of public meetings for the ***Juneau Access Supplemental EIS***. Susan led McDowell Group's efforts on stakeholder and public involvement for the ***Juneau Long Range Waterfront Plan***, the ***Downtown Juneau Tourism Transportation Study***, and the ***North Douglas Crossing Public Involvement Study***.

She had a lead role in McDowell Group's recent port development projects for Nome and Valdez. Both projects required an analysis of the regional multi-modal transportation system and economic factors affecting the port. She managed the ***Prince Rupert Cruise Industry Infrastructure Assessment and Gap Analysis*** and a multi-faceted project for Richardson Highway communities which included an inventory of tourism and recreational assets, market development strategies, and identification of infrastructure needed along the corridor to maximize economic activity and employment.

Susan developed the ***Business and Marketing Plan for SEAtrails***, a regional network dedicated to enhancing transportation, economic development, and quality of life in Southeast Alaska by developing and promoting the Alaska Marine Highway and recreation. The project included compilation of transportation statistics and market analysis, site visits to 11 communities, and more than 60 interviews with public agencies, local businesses, trail advocacy groups, and community leaders.

She recently rejoined McDowell Group after serving as Commissioner of the Alaska Department of Commerce, Community, and Economic Development. Her priority initiatives included enhancing transportation infrastructure, developing natural resources, and increasing Alaska's visibility in the national and international marketplace. She served as a director for the Alaska Railroad Corporation, Alaska Industrial Development and Export Authority, Alaska Gasline Development Corporation, and as Denali Commission State Co-Chair.

Her private sector experience includes Goldbelt Vice President, where was responsible for numerous business ventures including marine and bus transportation, Mt. Roberts Tramway, and several adventure tour companies. As a regional manager for Princess Tours, she managed motorcoach and port operations in several Alaska locations.

A lifelong Alaskan and former Haines resident, Susan is a University of Alaska Leadership Fellows Program mentor, a board member for Sealaska's Haa Aani Community Development Fund, and an Alaska Airlines advisory board member. She is a University of Alaska Southeast graduate.

### Education

B.A. Liberal Arts

### References

Diane Kinney, Ports & Harbor Director City of Valdez, 907-835-4564

Larry Gaffaney, Huna Totem President & CEO, 907-523-3671

# BENJAMIN C. HAIGHT | PRINCIPAL ELECTRICAL ENGINEER

**Project Role: Electrical Design Concepts**

HAIGHT & ASSOCIATES CONSULTING ELECTRICAL ENGINEERS

**Role in Project:** Benjamin C. Haight, PE, will lead the project electrical team. He will guide the HAI staff effort, providing them with technical guidance and facilitate quality assurance.

**Relevant Experience:** Mr. Haight founded Haight & Associates originally in 1980 as BC Haight, Consulting Engineers. He has over 42 years of electrical engineering experience, and has been practicing in Alaska since 1975. As the principal of the firm, he provides technical guidance to his staff and clients, oversees quality assurance of all project work, ensures compliance with contract requirements, and maintains vigilance of project and work schedules. Mr. Haight participates in the design and construction of electrical systems for harbors, docks and marinas, with experience extending for most of his career. The projects have involved lighting, power distribution, security cameras, metering, grounding, and various shore power configurations.

## RELEVANT PROJECTS

**Port Chilkoot Dock, Haines, AK.** This dock was recently renovated and provided with new electrical systems. The systems include LED lighting, power distribution, shore power for the small charter boat float, and power for miscellaneous equipment. *Contact: Brian Lemke, Public Facilities Director, Haines Borough, 907 766-2231 x28, blemcke@haines.ak.us*

**South Franklin Cruise Ship Dock Shore-Power.** Several projects at this facility include the original construction of the dock with power service and distribution, lighting, and capstans. Subsequently, the dock was upgraded with bus parking area lighting; and cruise ship shore power. The lighting incorporated flood lights using marine grade fixtures and high pressure sodium lamps. The shore power system involved a festooning system with several hard usage, 15 KV cables supplying power to the ships, as well as the utility service to and on the dock. Mr. Haight was instrumental in the design; and provided construction services for all of the projects. *Contact: Kirby Day, Director of Shore Operations, Princess Cruises & Tours, 907-463-3900, kday@princess.com*

**Ketchikan Berth III.** Provided all new power distribution and lighting for the new Berth III floating dock, a transient dock, the Casey Moran Harbor, a promenade, a visitor center and restroom facility, and bus shelter. Ketchikan recently contracted construction of facilities to increase and improve their cruise ship capacity, security, and mooring capability. The facilities include renovation of the current Berth II dock for better access and security, installation of the Berth III floating dock, installation of Transient floating dock, replacement of the Casey Moran Harbor to facilitate the new floating docks, the construction of a pedestrian promenade around the Casey Moran Harbor, and the construction of a visitor center with public restrooms & passenger shelter. The electrical systems included new service and distribution of 480 and 208 volt power, large vessel shore-tie power on the Berth III dock, vessel shore-tie power in the Casey Moran Harbor, lighting throughout, and building systems. *Contact: Dan Berg, Harbormaster, Ketchikan, 907 228-5632, danb@city.ketchikan.ak.us*

**Statter Harbor Fuel Float.** A new fuel dock was installed at the end of new main floats at this harbor with fuel dispensing facilities. The project included the electrical power for the lighting and office on the float as well as controls for the pumps at the bulk fuel tanks on shore. The controls involved data radio communications between the fuel float office and the pumps. The installation of fuel pipes in the harbor floats was coordinated with the electrical cables in conformity with the National Electrical Code. *Contact: Jim Beckham, VP Operations, Petro Marine, 907-224-3190*

## References

Kirk Miller, PE, Alaska Dept. of Transportation/Public Facilities, 907–465-1215
Jim Beckham, VP Operations, Seward Petro Marine Bulk Plant, 907-224-3190
Steve Corporon, Ketchikan Ports & Harbors Director, 907-228-5632
Carl Uchytil, Port Director, City & Borough of Juneau, 907-586-0292

## Education & Registration

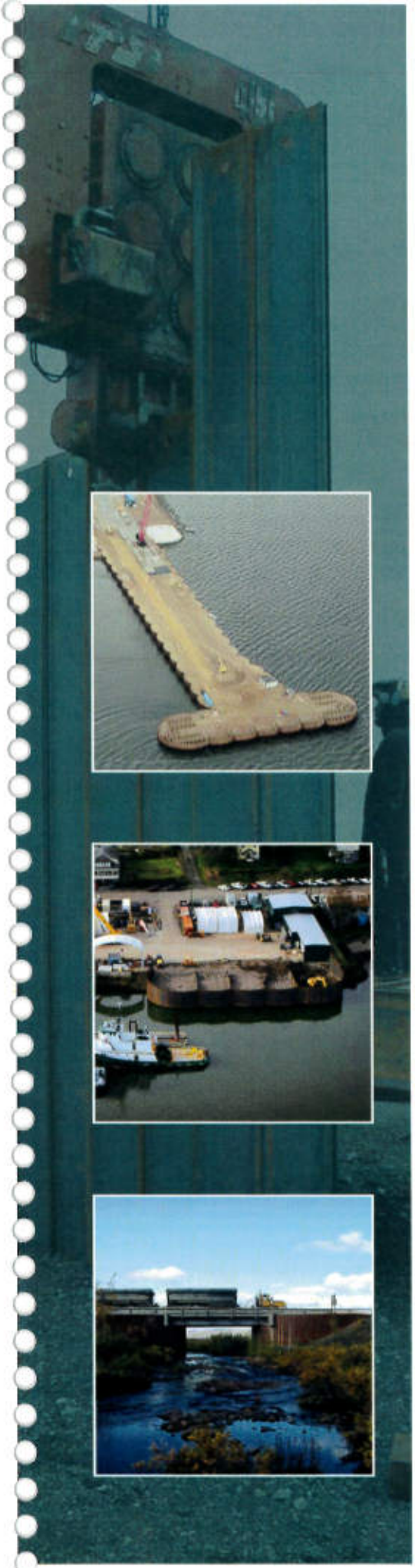
BS Electrical Engineering, Washington State University, Pullman Washington, 1972
Professional Electrical Engineer, State of Alaska, EE4800, 1979

## Affiliations

National Society of Professional Engineers
Institute of Electrical Electronic Engineers
Illuminating Engineers Society
National Society of Architectural Engineers
Alaska Association of Harbormasters and Port Administrators
Association of Energy Engineers
Aircraft Owners & Pilots Association
National Fire Protection Association
US Green Building Council

# APPENDIX B

## OPEN CELL™ and SPIN FIN™ Brochures










# OPEN CELL SHEET PILE™ TECHNOLOGY

P | N | D
ENGINEERS, INC.

# Our Client's Comments

*"This has been an extremely low-cost dock for us, first in construction costs as well as in maintenance costs."*
**- Warrenton Fiber Company**

*"PND has proven to be a dedicated team partner and a true steward of the environment. I believe that as word spreads, more environmental projects will see the benefits of the OPEN CELL SHEET PILE™ WIB for containing wastes in place as an alternative to risky excavation, transportation, and disposal efforts.I know they will have a good partner in PND on these projects."* **- AMEC Foster Wheeler**

*"The City of Nome now has three OPEN CELL bulkheads in its port system. These structures are exposed to the open ocean environment where waves can reach 14 feet and sea ice can be 5 feet thick! After 10 years of such exposure, the OPEN CELL bulkheads are performing well."* **- City of Nome**

*"PND was able to provide us with a unique solution for our new South Harbor that was both economical and effortless to construct. Thanks to PND and their creative design, the Port is ready to serve our region's growth for the next 50 years."*
**- America's Central Port**

*"Cheniere is very pleased with the engineering effort provided to us by PND Engineers during the development of our LNG terminal at Sabine Pass. The OPEN CELL bulkhead helped us solve a challenging shoreline slope stability issue providing a very economical solution."* **- Cheniere Energy**

*"The OPEN CELL dock design provides an uncomplicated structure which saved considerable cost over the alternative tied-back cantilever wall system. The OPEN CELL dock is being used to load-out very heavy loads, 600-ton bridge segments, using a 545-ton carrier for the new East Span of Oakland Bay Bridge Skyway in California."* **- Kiewit/FCI/Manson (KFM)**

*"The structure has required no significant maintenance - even with our heavy use. Our pile driving crew had no previous OPEN CELL [construction] experience - construction was completed successfully without significant problems."* **- KFM**

# The Technology

OPEN CELL™ technology is used for docks, heavy-load marine terminals, bridge abutments, and cofferdams. It is a cellular flat sheet pile structure in which each cell's sheet piles are driven into the shape of a U when viewed from above. The system functions as a horizontally tied membrane relying solely on the vertical flat sheet pile anchor wall to restrain a curved flat sheet pile arch face. The bulkhead becomes a series of U-shaped vertical member structures that does not need toe embedment for stability.

First developed in the early 1980s, the OPEN CELL system has received recognition from national and international engineering institutions such as ASCE and PIANC. The system has been recognized by the US Army Corps of Engineers for specialty use in confining contaminated soils. Our projects utilizing OPEN CELL technology have won more than 30 awards.

## NOVA Award

The OPEN CELL system was presented a NOVA award in 1988. The NOVA award, which has been referred to as the "Nobel Prize" for construction, is awarded annually by the Construction Innovation Forum, Inc. (www.cif.org) to revolutionary solutions, processes, or products that improve the quality, efficiency, and cost effectiveness of construction.

## Patents

PND has spent years testing, observing, and refining the OPEN CELL system and holds all related information to be proprietary. The OPEN CELL system is patented, holding U.S. Patent No. 6,715,964 B2, No. 7,488,140 B2, and No. 8,950, 981 B2.

# Advantages

**> High Loads**
High vertical capacity for localized loads such as cranes or uniform loads from freight can be easily supported. Uniform loads of 10,000 pounds per square foot and concentrated loads of 6,000 tons have been accommodated. In addition, load capacity can be increased by simply extending tailwalls even after construction has been completed, if project requirements dictate.

**> Deep Draft**
The increasing draft of vessels throughout the world has required increased dredge depths. Vertical faces of over 95 feet have been constructed while still maintaining the highest load capacities.

**> Dense Soils & Shallow Bedrock**
A minimal required toe embedment of 10 feet below potential scour depth is a common design tip elevation. This is significantly less than other structure types.

**> Weak Soils**
OPEN CELL structures accommodate soft clay and silts, allowing high capacities while still maintaining local and global stability.

**> Coastal Erosion Protection**
The OPEN CELL system is scour insensitive because it derives its strength horizontally from its vertical tailwall and not through passive toe resistance.

**> Ice Conditions**
The OPEN CELL system has effectively proven itself against the ice prevalent throughout Arctic and subarctic regions.

**> Seismic Protection**
OPEN CELL structures have survived hundreds of seismic events throughout the Pacific Rim. Not only have they survived, but they have remained in service with no damage noted.

PND is proud to present the OPEN CELL SHEET PILE system – a patented mechanically stabilized wall with a multitude of purposes and applications. The OPEN CELL system is more versatile and provides greater cost savings than comparable alternatives. PND continually works to improve this technology for all in-situ conditions and uses. We are confident that you will agree with us that the OPEN CELL system is a time-tested system that allows you to build a vertical wall higher, with larger load capacity, and in more challanging soil conditions than any other retaining wall structure.

*Jim Campbell, P.E.*
President

# Applications

- Retaining walls
- Module loading piers (MOF and TOF)
- Deep-draft berths
- Cofferdams and heavy shoring
- Contaminated soils containment and disposal
- Cruise ship terminals
- Soil erosion protection
- High capacity bridge abutments
- Offshore man-made islands
- Man-made reefs and levees
- Tsunami safe haven berms, islands, and platforms

# Components

The OPEN CELL system utilizes a flat-web sheet pile and welded or extruded connectors. The simplicity of the design and durability of the materials allow PND to adapt the OPEN CELL system to many uses and conditions.

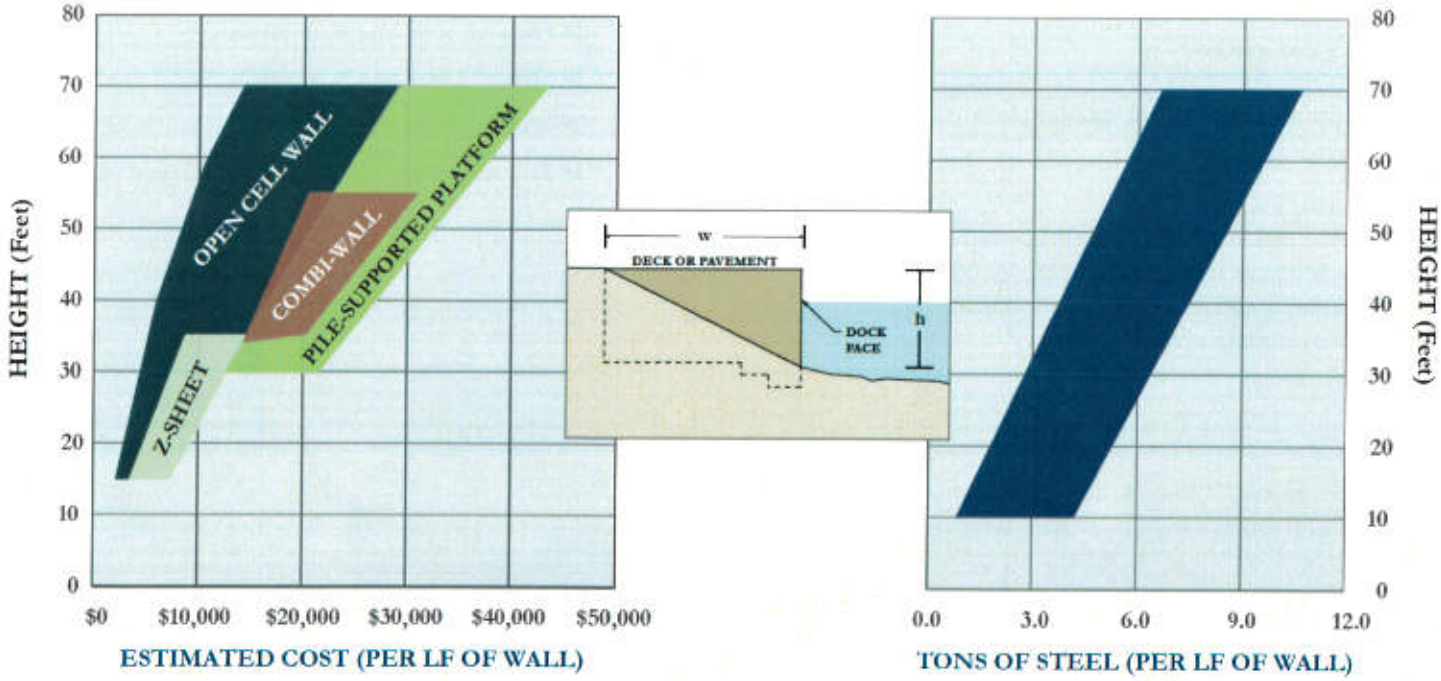
H-Pile Anchor

Welded Wye Pile

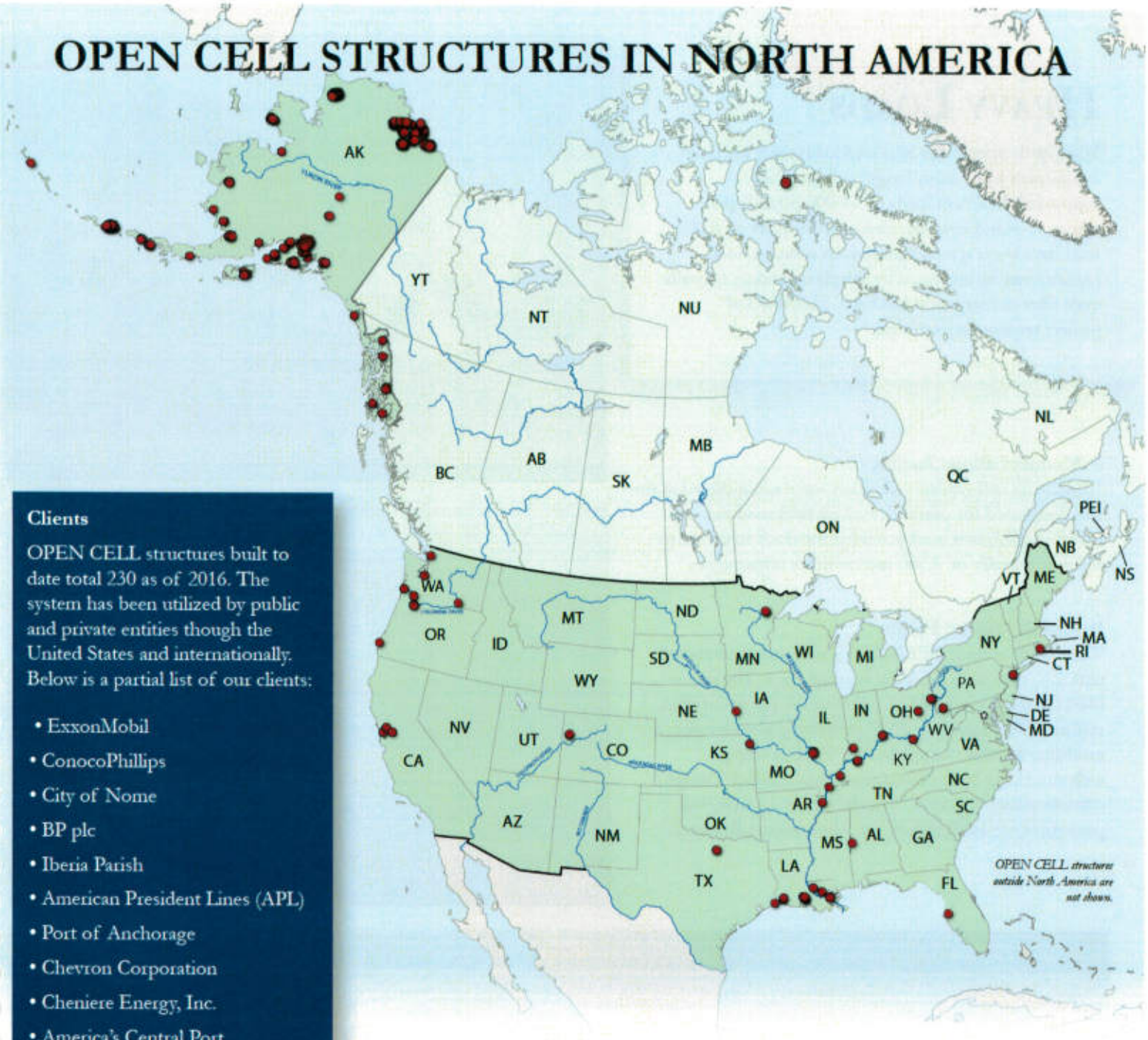
Flat Sheet Pile and
SWC Extruded Connector

# Average Costs & Materials

On average, the OPEN CELL wall is a lower-cost option to typical wall types, including z-sheet pile walls, and combi-walls. The overall cost per foot remains competitive in structures, particularly those over 30 feet tall, due to the way the OPEN CELL structures are designed.



# OPEN CELL STRUCTURES IN NORTH AMERICA




**Clients**

OPEN CELL structures built to date total 230 as of 2016. The system has been utilized by public and private entities though the United States and internationally. Below is a partial list of our clients:

- ExxonMobil
- ConocoPhillips
- City of Nome
- BP plc
- Iberia Parish
- American President Lines (APL)
- Port of Anchorage
- Chevron Corporation
- Cheniere Energy, Inc.
- America's Central Port
- Horizon Lines
- City of Juneau
- Minnesota Power
- Matson
- Sasol Limited
- Haliburton Company
- Iraqi Navy
- U.S. Army Corps of Engineers
- Foss Maritime
- U.S. Navy

**Contractors**

OPEN CELL structure construction is standardized by the use of driving templates and industry-standard equipment. Provided the contractor has an established means and methods procedure, the system can be installed by any skilled construction team. Professional contractors with experience constructing OPEN CELL SHEET PILE structures include, but are not limited to the following:

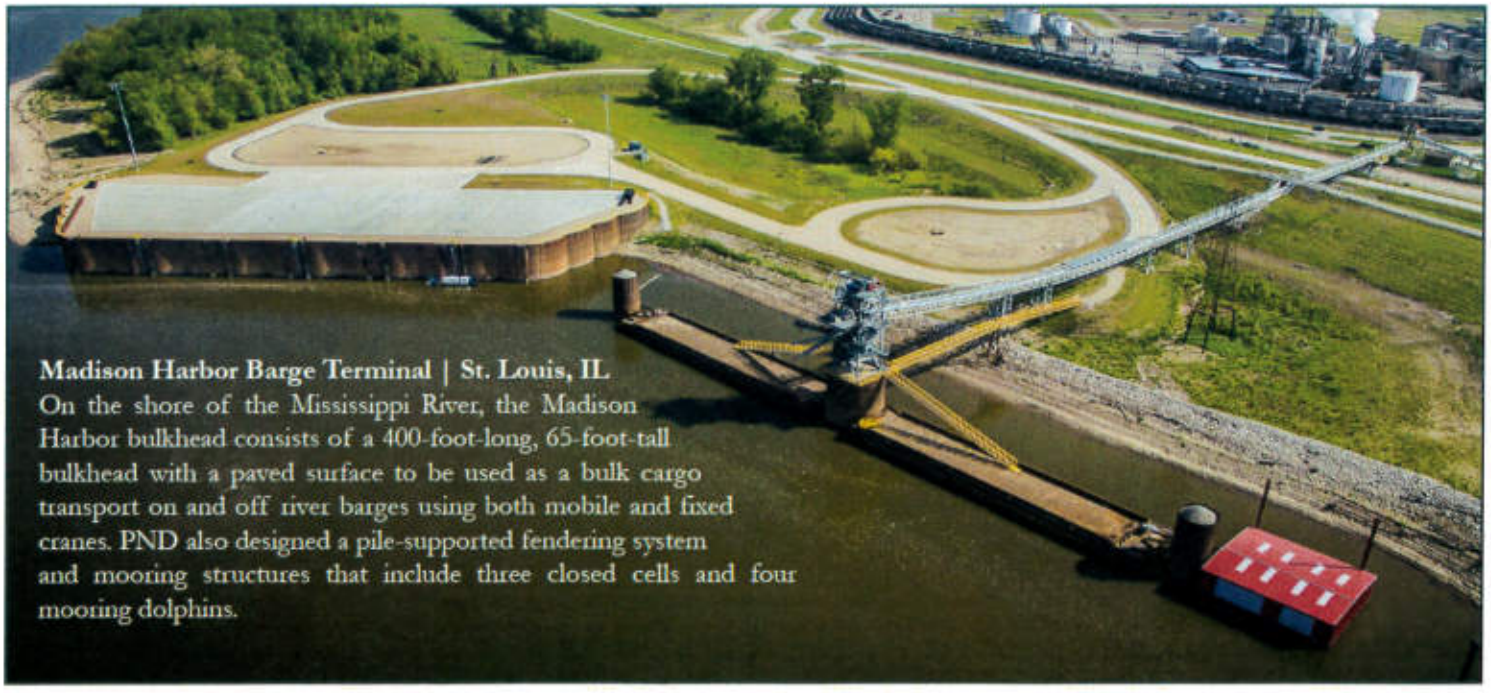
- Cajun Deep Foundations
- Ruskin Construction LLC
- Kiewit Construction Co.
- Manson Construction
- Pacific Pile & Marine, L.P.
- Lash Corporation
- Kelly-Ryan, Inc.
- Boh Bros.
- MKB Contractors
- Berry Bros.
- Swalling Construction Co.
- Traylor Bros.
- Orion Marine Constructors
- Alaska Interstate Construction
- Advanced American Co.
- Richard Goettle, Inc.
- M.R. Pittman Group
- JF Brennan Co.
- CJ Mahan
- BoMac

# Heavy Loads

High load capacity for localized loads such as cranes or uniform loads from freight can be easily supported. Uniform loads of 10,000 pounds per square foot and concentrated module loads of 6,000 tons have been accommodated. In addition, load capacity can be increased by simply extending tailwalls even after construction has been completed, if project requirements dictate.

**> Module Offload Facility**
Underlying soft marine sediments were encountered at the site designated for prefabricated oil field modules. An OPEN CELL bulkhead provided the dock structure to support transfer of 2,500-ton modules onto barges.

**> Module Offload Facility**
This 665-foot-long OPEN CELL pier was constructed with 240-foot-long fendered berthing face. The pier is used for the live offload of 3,000-tonne pre-assembled, self-propelled modules. PND provided finite element modeling for this unique facility, which is able to withstand over 100KN during module offload. Design considerations included: variable seismic criteria, soil properties, ice loading, and a 8.5-foot scour allowance.



**Madison Harbor Barge Terminal | St. Louis, IL**
On the shore of the Mississippi River, the Madison Harbor bulkhead consists of a 400-foot-long, 65-foot-tall bulkhead with a paved surface to be used as a bulk cargo transport on and off river barges using both mobile and fixed cranes. PND also designed a pile-supported fendering system and mooring structures that include three closed cells and four mooring dolphins.

# Deep Draft

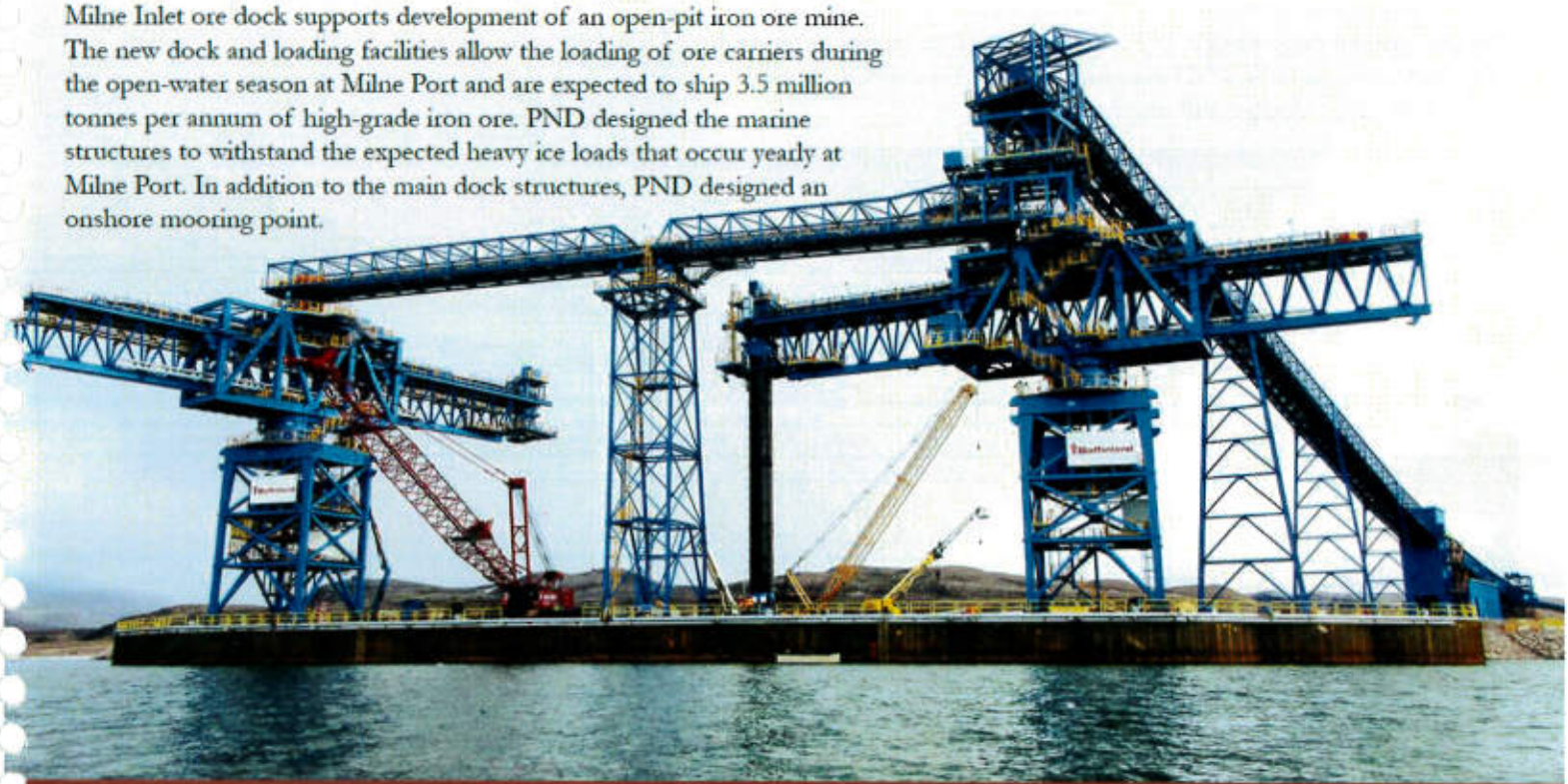
The increasing draft of vessels throughout the world has required increased dredge depths. Vertical faces of over 70 feet have been constructed while still maintaining the highest load capacities.

**< Container Terminal**

The dock structure is a 330-foot-long pile-supported pier supporting a modern 100-foot gauge container crane. The site has a deep layer of very soft soils requiring piles to be socketed into bedrock. PND designed the structure to accommodate large container-handling forklifts with 100-ton axle loads. The lateral resistance system utilizes an innovative sheet pile system to drag lateral loads into the fill behind the dock structure. Dolphin structures extend the dock to more than 600 feet.

**v Baffinland Iron Mines Bulkhead - Nunavut, Canada**

Milne Inlet ore dock supports development of an open-pit iron ore mine. The new dock and loading facilities allow the loading of ore carriers during the open-water season at Milne Port and are expected to ship 3.5 million tonnes per annum of high-grade iron ore. PND designed the marine structures to withstand the expected heavy ice loads that occur yearly at Milne Port. In addition to the main dock structures, PND designed an onshore mooring point.



# Dense Soils & Shallow Bedrock

Zero to minimal required embedment of the face sheets allow construction directly on bedrock. Often face sheet embedment is limited to the potential scour depth. This advantage allows OPEN CELL structures to potentially be constructed without the costs related to pre-dredging or pre-drilling.

**V Kloosterboer Marine Terminal Bulkhead - Unalaska, AK**
Designed as a 100-year facility in a highly active seismic area, the terminal provides a dramatic advance in seafood trans-loading and cold storage technology for Dutch Harbor, the largest seafood producing port in the US. The OPEN CELL system was determined to be 50% less expensive than alternatives. The dock, which features 96-foot-long sheet piles, provides 46 feet of vessel draft and a high-capacity freight dock, and created over 3 acres of usable uplands in the mountainous area.

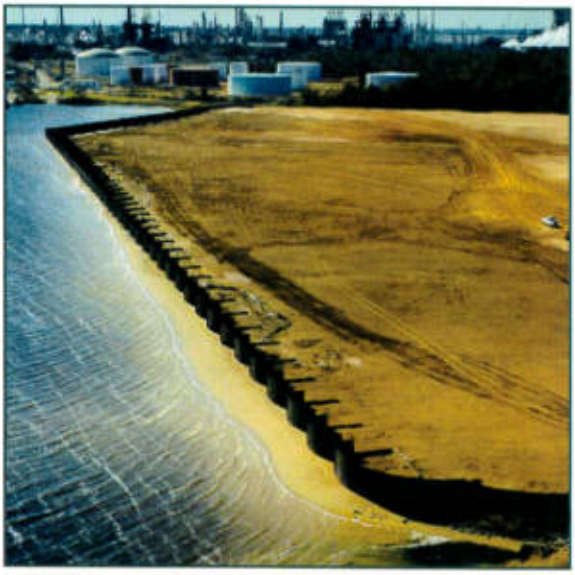
**> Owensboro Riverport General Cargo Dock - Owensboro, KY**
PND provided planning and design services for a new OPEN CELL general cargo dock on the Ohio River for the Owensboro Riverport Authority of Kentucky. Services for this port development project included geotechnical review, bid support, and fabrication inspection. The new general cargo dock is 212 feet long, with four mooring cells and an upland operating area. PND designed the dock for use with mobile cranes, bulk cargo storage, and heavy truck traffic.

# Weak Soils

OPEN CELL structures have proven to be an excellent solution to stabilize fill placement over weak underlying soils. The system works like a mechanically stabilized earth (MSE) wall to confine and strengthen a soil mass. This provides local and global stability. If settlement occurs behind an OPEN CELL structure, the material will settle evenly preventing the types of failures seen in tied-back and combi-wall systems.

**^ Sabine Pass LNG Terminal - Cameron Parish, LA**
PND provided design for this 1,500-foot OPEN CELL bulkhead at the Sabine Pass LNG Terminal. The bulkhead was designed so that it could be dredged or experience scour to elevation -45 feet, creating a wall height of 55 feet. The OPEN CELL bulkhead system was chosen for this site to deal with local soft clays, clearance issues to an adjacent pipeline rack, and for the significantly lower cost over shoreline revetment.

**v Petro-Chemical Plant - Lake Charles, LA**
This bulkhead provides flood protection and assists with the owner's land reclamation project. The 19-foot-tall wall is more than 2,000 feet long and was constructed though layers of weak organic soils, soft to stiff clay, and dense sand.



**< Umm Qasr Seawall - Umm Qasr, Iraq**
PND designed an OPEN CELL SHEET PILE bulkhead system with an adjoining floating pier for the USACE. The project was constructed for the Iraqi Navy at the Umm Qasr Naval Base. The new facility, the only one of its kind in the area, was designed to retain up to 45 feet of fill over soft underlying silt and clay. The bulkhead utilized both land- and marine-based construction.

**^ Chevron Wall - Nikiski, Alaska**

Fuel spills on upland property began leaking into Cook Inlet, AK, which is subject to severe wave and ice conditions. An OPEN CELL SHEET PILE structure was driven into an underlying clay layer with the top of the wall above high-tide wave action. An oil-collection system was installed behind the erosion-control bulkhead to capture migrating contaminants.

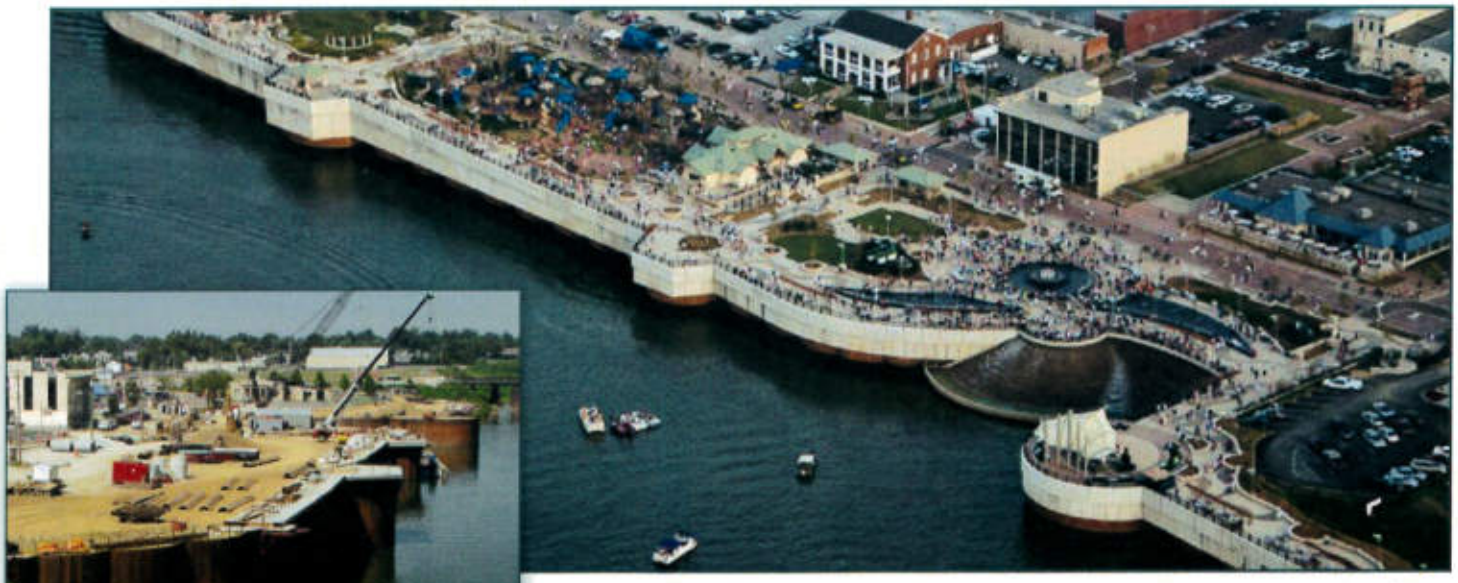
# Coastal Erosion Protection

Due to its resilience in a variety of soil conditions, OPEN CELL technology may be utilized to support eroding slopes. In the marine environment the system is scour insensitive as it derives its strength horizontally from its vertical tailwall not through passive toe resistance. Outside the marine environment, major slope stability is another of the OPEN CELL system's versatile uses.

**v Owensboro Riverwalk - Owensboro, KY**

When the City of Owensboro, Kentucky, began the redevelopment of its downtown waterfront on the Ohio River, two objectives were desired: stabilize a chronically sloughing bluff and create more park area.

The City Engineer reassessed the situation and allowed value-engineered alternative design bids from contractors. One of the bidders, Richard Goettle, Inc., used PND's OPEN CELL system as a substitute earth-retention system, offering nearly $13 million in cost savings and reducing the amount of steel by 30%, as well as saving six to eight months of wall construction time.



**^ Nome Port Breakwater Bulkheads - Nome, Alaska**
PND has designed five separate waterfront structures around City of Nome property. Three of these are dock facilities, each approximately 200 feet long. These OPEN CELL structures are designed to withstand and be overrun by 4-foot-thick sea ice floes (insert) and resist 16-foot waves. The most recent, the middle of the three structures above, was completed in 2015. The other bulkheads date back more than twenty years.

## Ice Conditions

The OPEN CELL system has effectively proven itself against the ice prevalent throughout Arctic and subarctic regions.

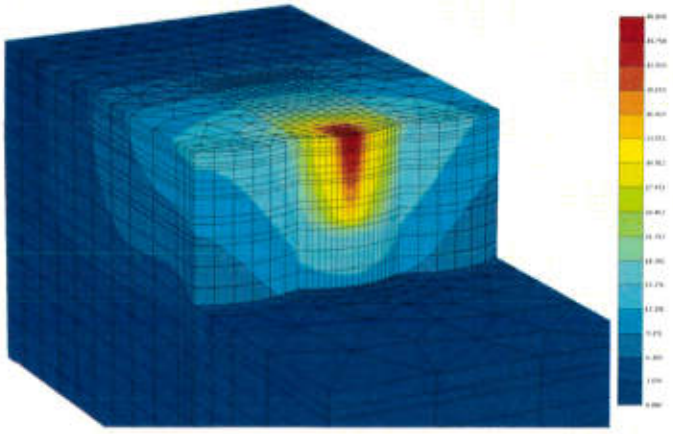
**v Northstar Offshore Island - Prudhoe Bay, Alaska**
This project incorporated a 360-foot-long OPEN CELL bulkhead at the south end of the original Northstar Island (insert). The dock provides deep-water access to the island while still providing ice resistance and scour protection. More than ten years after the first OPEN CELL bulkhead was installed, the owner chose to expand the southeast corner of the island, connecting the existing structure with the new bulkhead. The dock allows for direct offload of 3,500-ton modules and provides protection against severe ice, wave, and wind conditions. The project included long-term erosion protection; a high-capacity module barge dock designed for 4,500-ton sea-lift module offload; seawater intake system and cofferdam; offshore dredging; armor rock erosion protection; and an emergency vehicle egress ramp.

# Seismic Stability

Many of our OPEN CELL projects are located in the highly seismic Pacific Rim area. Since construction of the first OPEN CELL structure in Alaska in the early 1980s, there have been more than thirty large-magnitude earthquakes in Alaska alone. PND has constructed approximately 230 OPEN CELL structures in high-seismic areas during this time, and none of them have experienced any seismic failure or damage.

# Structural Stability

Rigorous structural analysis is performed on every structure we design and can include multiple methods involving both classic analysis and numerical methods.



**^ American President Lines Dock - Dutch Harbor, AK**
Built to support the expanding Bering Sea fishing industry, this 350-foot-long OPEN CELL bulkhead was constructed to support heavy-load operations from the fishing industry as well as heavy cargo. The proposed facility provided container crane access to all holds on the largest APL ships and about 6 acres of new, and much needed, container storage space.

# OPEN CELL System vs. Industry Standard

It is not uncommon to see or read about catastrophic failures of industry-standard bulkhead designs due to overloading ground settlement, corrosion, and seismic events. At right is the typical failure mode of a combi-wall bulkhead in Seward, Alaska. The failure occurred after a large earthquake, which caused extensive damage and required significant restoration to the waterfront.

Below is an OPEN CELL bulkhead supporting a waterfront hotel in Seward that has been subjected to equivalent seismic forces. This structure and other similar OPEN CELL bulkheads in Seward have experienced no failures or damage due to seismic activity.

**^ Designed by others: failure of a z-sheet combi-wall bulkhead**

# Vertical Confined Disposal Facilities

Conventional Confined Disposal Facilities (CDF) are typically constructed using an earthen or rock dike, but these structures are porous and permeable. Flow through the OPEN CELL bulkhead decreases to a point where a watertight barrier is formed, thus preventing containment transport. A VCDF, employing OPEN CELL technology, will require less space for dike construction and can therefore have a larger dredged material capacity for the same areal footprint when compared to conventional CDFs using conventional dikes.


## ALTERNATIVE CONTAINMENT METHOD REVIEW BY USACE

The OPEN CELL system has been reviewed by the USACE to determine its acceptability as a Vertical Confined Disposal Facility (VCDF). The USACE Environmental Laboratory at the Engineer Research and Development Center in Vicksburg, Mississippi, concluded in its final report that the OPEN CELL system, "...can be effective for controlling environmental risk for containment of dredge material."

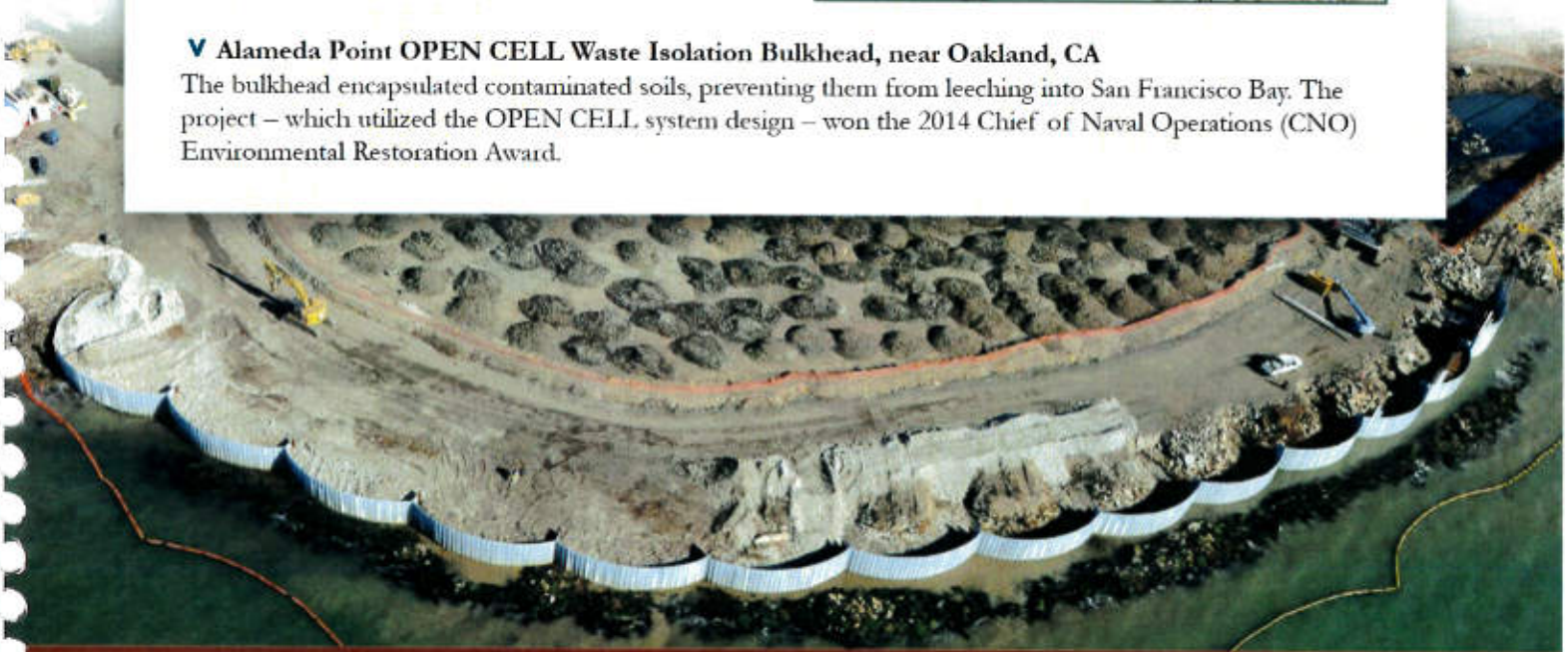
**The USACE report is available at www.pndengineers.com.**

## The OPEN CELL VCDF:

- Reduces or eliminates contaminant migration under the containment structure.
- Is constructible in poor soil conditions and deeper water.
- Provides a vertical face and the ability to dredge directly in front of the containment wall.
- Eliminates seepage through the containment structure.
- Able to encapsulate existing structures (Photo at right: Tampa, Florida).

**Alameda Point OPEN CELL Waste Isolation Bulkhead, near Oakland, CA**

The bulkhead encapsulated contaminated soils, preventing them from leeching into San Francisco Bay. The project – which utilized the OPEN CELL system design – won the 2014 Chief of Naval Operations (CNO) Environmental Restoration Award.



# Cofferdams and Levee Support Structures

Photo courtesy of PCCP Constructors, A Joint Venture

## Permanent Canal Closures and Pumps (PCCP) Project Cofferdams

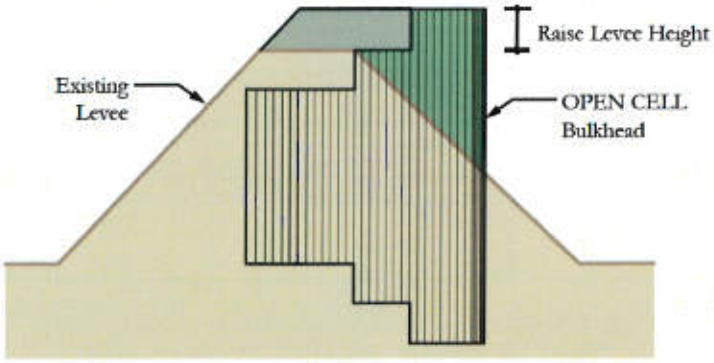
Permanent Canal Closures and Pumps (PCCP) is the keystone project that closes the Hurricane Risk Reduction System around the City of New Orleans. PCCP Constructors (A Joint Venture between Kiewit, Traylor Brothers, and M.R. Pittman) selected PND Engineers to develop the OPEN CELL SHEET PILE system for pump station cofferdams and permanent pump intake retaining walls.

The OPEN CELL system proved to be well suited for these challenging soil conditions. The OPEN CELL cofferdam design provided a free field of construction for the pump station since no internal bracing was required to support the cofferdam walls – all the wall loading was supported by the tailwalls. The PCCP pump station cofferdams are among the largest cofferdams ever constructed on the U.S. Gulf Coast.


The OPEN CELL SHEET PILE system retains 48 vertical feet of soil plus 20 vertical feet of differential water pressure. The bottom of the cofferdams was approximately 50 feet below sea level. The plan area of the cofferdam varied up to 160 feet wide by 250 feet long.

The design of the OPEN CELL SHEET PILE system was thoroughly reviewed, vetted, and authorized for construction by the USACE and third-party reviewers. The system saved the Design-Builder tens of millions of dollars on construction and provided a significant schedule advantage by not needing to construct the pump stations around internal bracing within the cofferdam.

## OPEN CELL Levees




The OPEN CELL system is an innovative technology for rehabilitating and upgrading levees.

# Bridge Abutments

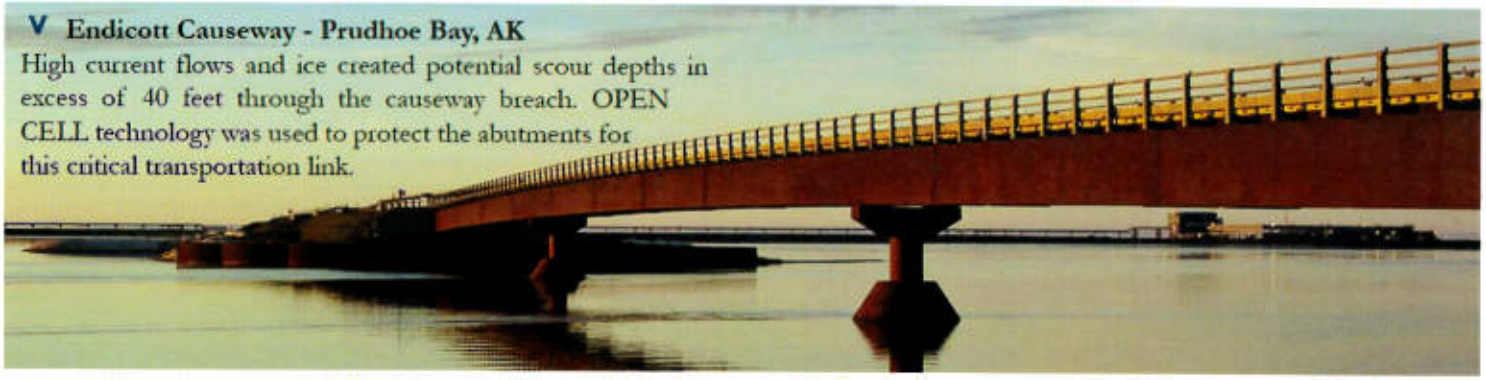
Bridge abutments utilizing OPEN CELL technology are resistant to scour and are able to support heavy loads. Additionally, OPEN CELL bridge abutments may be constructed very quickly.

**Kuparuk Low Water Crossing - North Slope, AK**
With an overall length of 700 feet, this causeway bridge over a breach in a previously earth-filled ocean causeway is supported by two in-water conical pile-supported piers and features abutments protected by OPEN CELL SHEET PILE bulkheads. The breach is designed for up to 38-foot scour below existing seabed, and the design ice load on the piers is 500 kips.

**Cornelius Pass Bridge - Burlington, OR**
The creek crossing was bridged with a combination of OPEN CELL pile abutments and a recycled bridge section, which came from a nearby abandoned line. The OPEN CELL abutments were necessary to keep fill slopes out of the creek and within the right-of-way.

**'C' Street Bridge at Ship Creek - Anchorage, AK**
This 136-foot-long bridge over the tidally influenced Ship Creek is located on soft marine sediments. OPEN CELL bulkhead abutments were used to provide a stable erosion-protected surface for a cast-in-place footing for the box girder bridge.

**Endicott Causeway - Prudhoe Bay, AK**
High current flows and ice created potential scour depths in excess of 40 feet through the causeway breach. OPEN CELL technology was used to protect the abutments for this critical transportation link.



# Installation Methods for the OPEN CELL System

Construction of the OPEN CELL system is typically performed from a barge or from shore. Land-based is more common than marine-based construction and often the most cost effective. Utilization of the OPEN CELL system's simple design allows a contractor to gain efficiency and shortens the overall duration of construction. We have broken up the installation methods of the OPEN CELL system into five steps: site preparation; set pile driving template; drive wye piles; drive sheet piles; and compact backfill and finalize deck face.

### Step 1: Site Preparation

The first step in OPEN CELL structure installation is site preparation. This includes preparing a crane pad for land-based construction, or assembling a barge if construction is marine-based.

### Step 2: Set Pile Driving Template

The cells are formed using a pile template to guide the flat sheet piles into place. Templates typically consist of two steel platforms, matching the shape of the arc and the straight tailwall.

### Step 3: Drive Wye Piles

Construction usually begins at a wye pile driven at an end cell. A surveyor locates the position of the wye pile and it is partially driven with adjacent sheet piles in both the tailwall and structure face.

### Step 4: Drive Sheet Piles

Flat sheet piles are threaded into an adjacent pile interlock, similar to z-sheet piles. Each pile is driven to stable embedment, supported by the driving template. Installation involves a vibratory hammer to advance the sheet pile into position. Care is taken to maintain location and plumbness and to not advance a single sheet pile more than 5 feet ahead of the adjacent sheet pile.

### Step 5: Finishing and Appurtenances

> Fill height differential between two adjacent cells must be kept within 5 feet to avoid bending of the tailwalls.

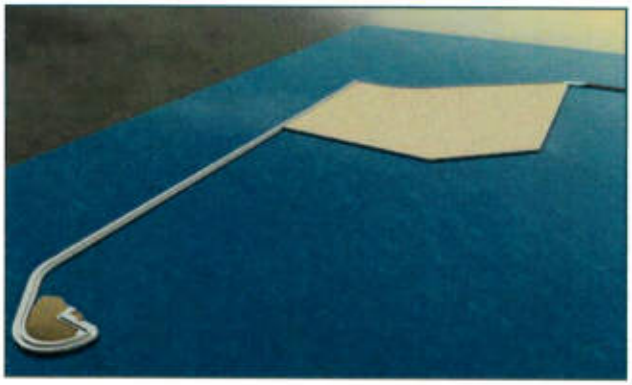
> The fill below the water level is consolidated using vibracompaction. Fill above the water level is roller compacted. Lastly, the dockside edge is finished with deck fixtures such as fenders, bollards, and surfacing.

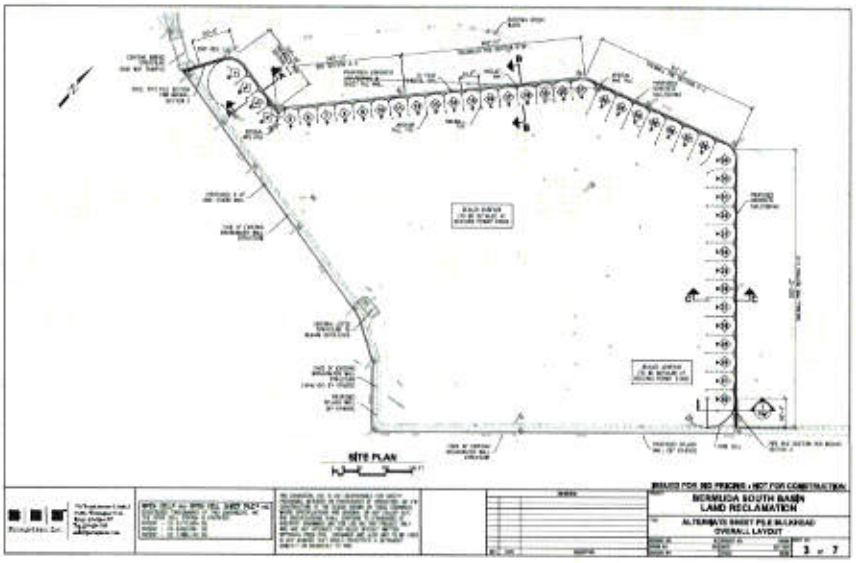
# Fenders & Appurtenances

After an OPEN CELL structure is constructed and backfilled, the top is finished with either rock surfacing or pavement of the client's choice. Various types of edge finishing can be employed to obtain a linear face on which to moor and operate. Continuous or intermittent steel or concrete beams have been utilized. In some cases structures have been designed to accommodate concrete panel facades. In addition to finishing, there are many different types of fender and bollard systems that may be used. PND's engineers determine the mooring systems based on the design criteria of the structure and the intended uses.

# Planning For Your Project

PND can provide immediate support to our clients to identify if an OPEN CELL bulkhead alternative will provide value and cost savings to their project. We offer our services to develop concept-level drawings and cost estimates at a level we call 'white papers'. With an understanding of your project goals and basic site information, such as local geotechnical conditions, we can produce drawings and estimates in a matter of days. With this information our clients can determine if the project is feasible or more cost effective than other alternatives.






The process of developing a white paper and seeing it through to construction and final completion of a project is very exciting. The Bermuda South Basin Land Reclamation project is one such project. Located at Sandy's Parish in Bermuda, the new 1,345-foot-long bulkhead will form two of the four sides of the new 9-acre reclamation area in the South Basin. PND initially performed a value engineering analysis for the project's contractor, Cashman Dredging and Marine Contracting, from Quincy, MA. The original proposed bulkhead type was a combi-wall system. Based on the value engineering analysis, we determined that it was neither a practical nor cost-effective way to create this large a reclamation area. After an analysis of the total area and the owner's intended use of the bulkhead, the OPEN CELL system was determined to provide a substantial cost savings and a full 50% reduction in the quantity of steel as compared with the original bulkhead design.

The nine reclaimed acres will initially be used as a staging area and village for preparation of the 2017 America's Cup sailing race. After the race, the bulkhead will be utilized by the owner as additional waterfront property to benefit the densely populated island community.

## Providing Comprehensive Civil/Structural Services Since 1979

PND is a civil/structural engineering firm specializing in civil infrastructure, ports and harbors, coastal engineering, Arctic engineering, geotechnical, and construction engineering for more than 35 years. Visit us online at www.pndengineers.com.

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# SPIN FIN®
# PILES

P | N | D
ENGINEERS, INC.

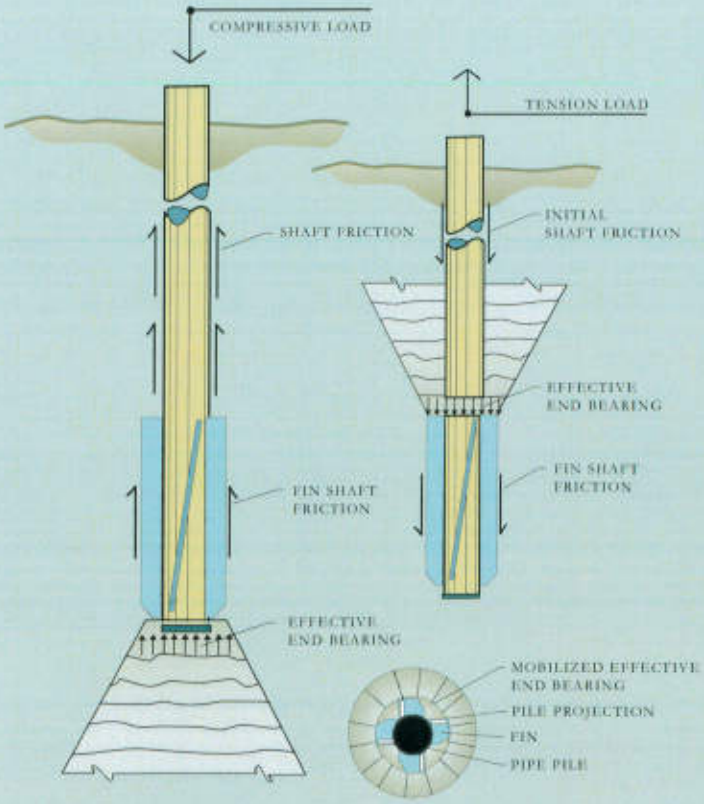
# SPIN FIN® PILES

SPIN FIN piles are a cost saving alternative for many pile foundation applications. This PND proprietary invention consists of a pipe pile equipped with angled plate fins. When driven, these piles rotate into the ground and achieve pile capacities far in excess of conventional piles. The strength is derived from the pile tips end bearing.

## FUNCTION

PND has performed extensive pile tests in a variety of soils including sand, silt, clay, silt with cohesion, gravel, and dense till. The screw-shaped tip on the pile and friction from the pile shaft give the SPIN FIN pile its stength.

The graphic below represents a SPIN FIN pile under tension and compression. When the pile is pulled in tension, a soil cone (visible in gray) is created that increases the capacity of the pile. By activating the soil cone, the SPIN FIN tip generates significantly more resistance to tensile loads than that of a conventional pile. Similar results are attained for compression piles.




## APPLICATION

These piles have been in use since 1983, when PND first developed them. Since then, thousands of piles have been installed in a variety of applications:

- Limited overburden – Pile tensile capacities have been tested in excess of 800 kips with a pile embedment as little as 50 feet.
- Soft soils – Pile lengths have been reduced by as much as 50% with the use of SPIN FIN tips in softer soils.
- Seismic capacity – The SPIN FIN pile exhibits significant reserve strength with cyclic loading that has advantages in seismic events.
- Energy absorption – SPIN FIN piles can absorb a huge amount of energy through deflection without loss of strength. This is significant in applications such as breasting dolphins.

SPIN FIN piles are often used in docks, dolphins, retaining wall tiebacks, wave barriers, seismic anchors and other pile foundations where anticipated uplift or impact load may cause failure. Because of their load deformation characteristics, these piles allow substantial pile overload deformation without catastrophic failure even after repeated loading.

## PILE'S COST SAVINGS

A reduction in the number of piles necessary and length of piles in an application creates significant cost savings for the client. Savings are also evident in construction time because the process results in shorter and fewer piles being driven, reducing crane and equipment size.

The dolphins on this page provide a comparison of structure between the SPIN FIN pile and that of a conventional pile. Cost savings are clear with a cursory review.

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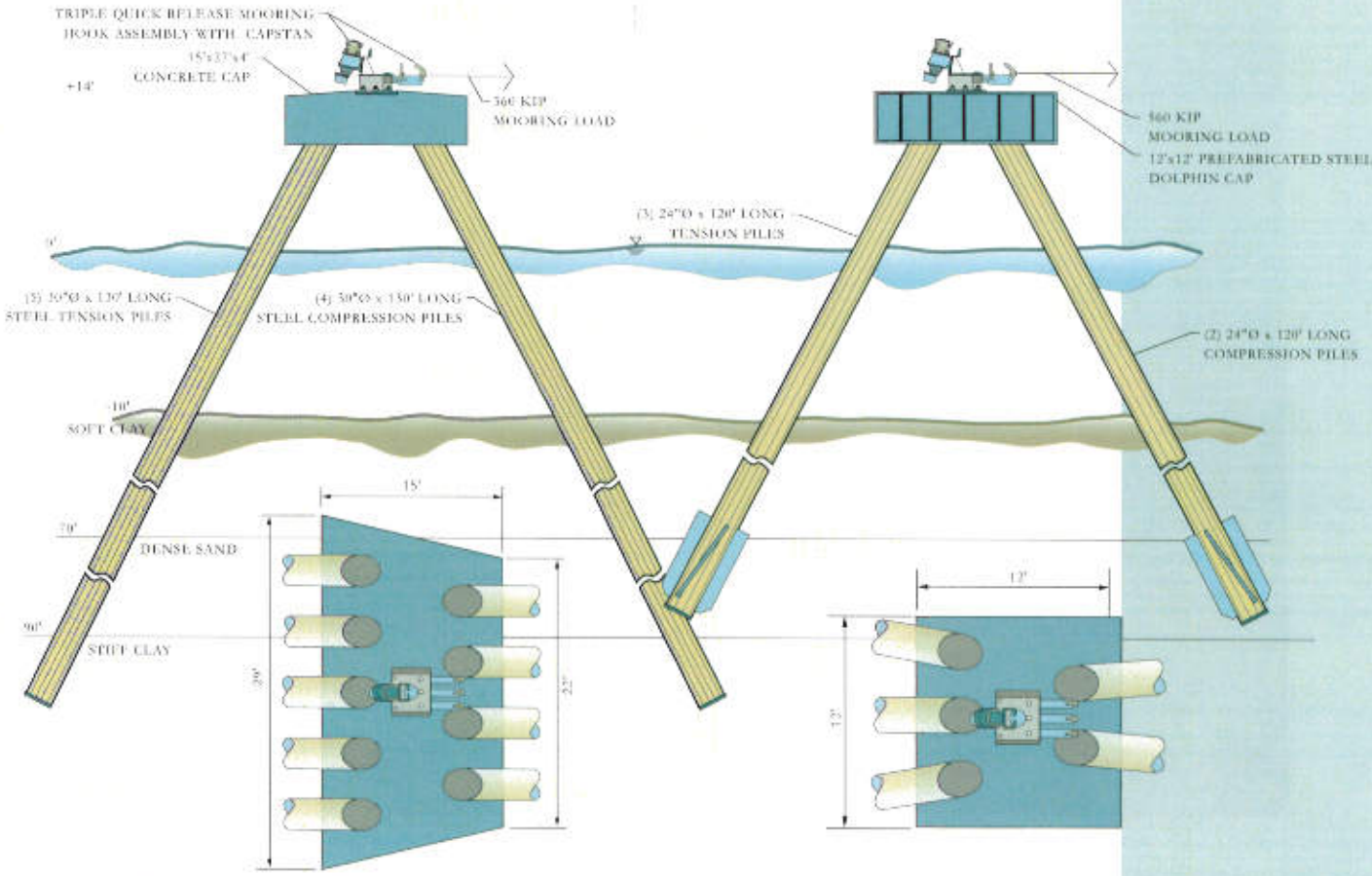
STRUCTURE HEIGHT: 25 feet
MOORING LOAD: 280 ton horizontal
SOIL CONDITIONS: Shown on diagram

TYPICAL CONCRETE PILE WITH CAST-IN-PLACE CONCRETE CAP

SPIN FIN PILE WITH PREFABRICATED STEEL CAP



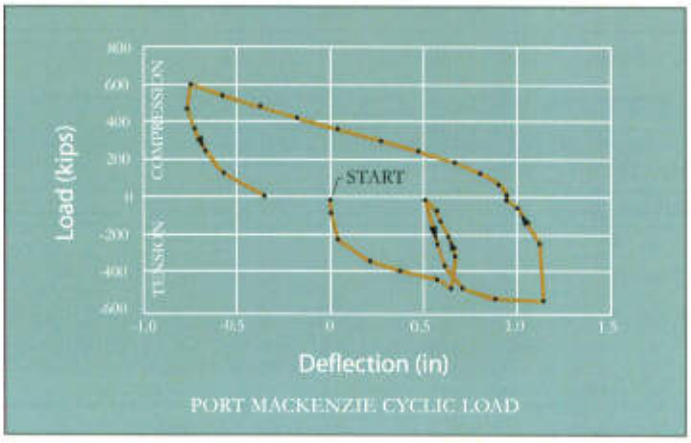
## CONSTRUCTION METHODS

SPIN FIN® piles have been successfully driven using both conventional impact and vibratory hammers, with templates and accessories. Driving the SPIN FIN pile causes rotation as predicted by the path on the outside of fins. Steel pipe piles with in-lead splicing allow the advantage of construction in very deep water or wherever deep pile penetration may be required. PND has designed dolphins that have been built in water depths over 100 feet deep.

# PILE LOAD TESTS

PND has performed a significant number of SPIN FIN® pile load tests in a variety of soil conditions that include cyclic, tensile and compressive tests. These tests generally follow ASTM D3689-83, Section 7.7, "Quick Load Test Method for Individual Piles." Piles are restrained from rotation. Pile failure is commonly defined as the point that constant jacking pressure (from continuous jacking) results in continual pile movement. The strength of the SPIN FIN tip is evident when shown compared with load test results for smooth pipe piles such as in the Colton Interchange work done for Caltrans (detailed below).

## PORT MACKENZIE CYCLIC TESTING

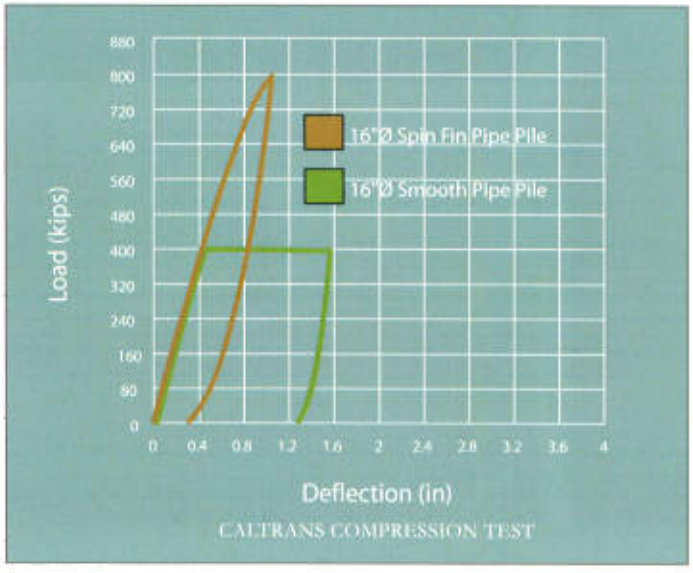


PORT MACKENZIE CYCLIC LOAD

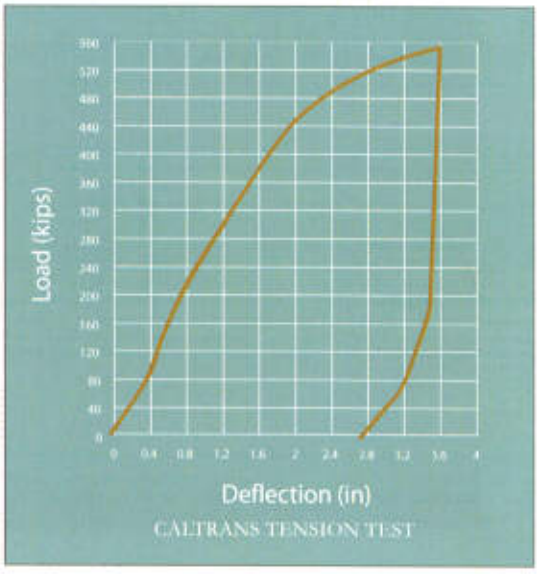
Soil strata consisted of 50 feet of gravel fill underlain with dense silty clay. A 24-inch diameter pipe pile with 6-inch fins was driven a total of 79 feet below grade.

## CALTRANS COLTON INTERCHANGE

Soil strata was generally fine-grained sand with some silt, clay and gravel to depth with effective SPT values from 10 to 50. Sixteen inch diameter pipe piles with eight inch SPIN FIN tips were driven 56 feet.



CALTRANS COMPRESSION TEST

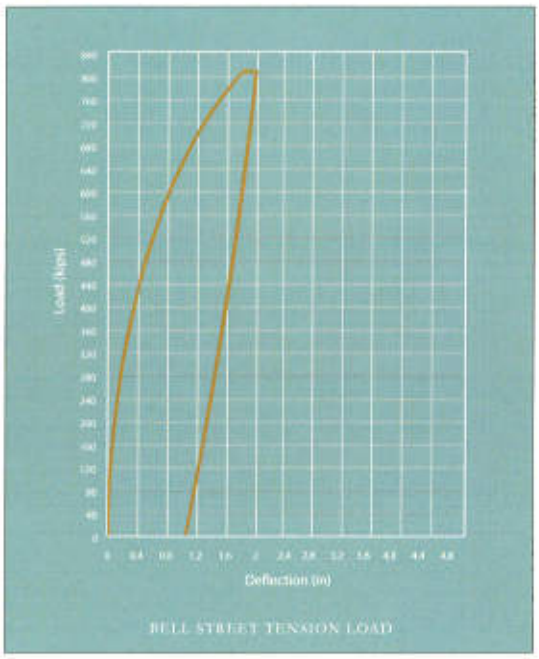


CALTRANS TENSION TEST

## SEATTLE'S BELL STREET PIER

Bell Street Pier is a unique facility which provides public moorage, cruise ship operations, a conference facility, public viewing and waterfront restaurants. This multiuse facility for the Port of Seattle uses PND innovations that provided cost effective construction while meeting varied operational requirements. It incorporates the use of the Partial Penetrating Wave Barrier and platform docks, both with lateral resistant battered SPIN FIN® piles. The facility integrates steel and concrete design.

Soil conditions consisted of soft marine sediment from a mud line elevation of -15 feet to -30 feet Mean Lower Low Water (MLLW) over a silty sand (SPT=20) to -45 feet MLLW overlaying dense till (SPT=50). A 24-inch pipe pile with 9-inch SPIN FIN tips was driven to approximately 45 feet.

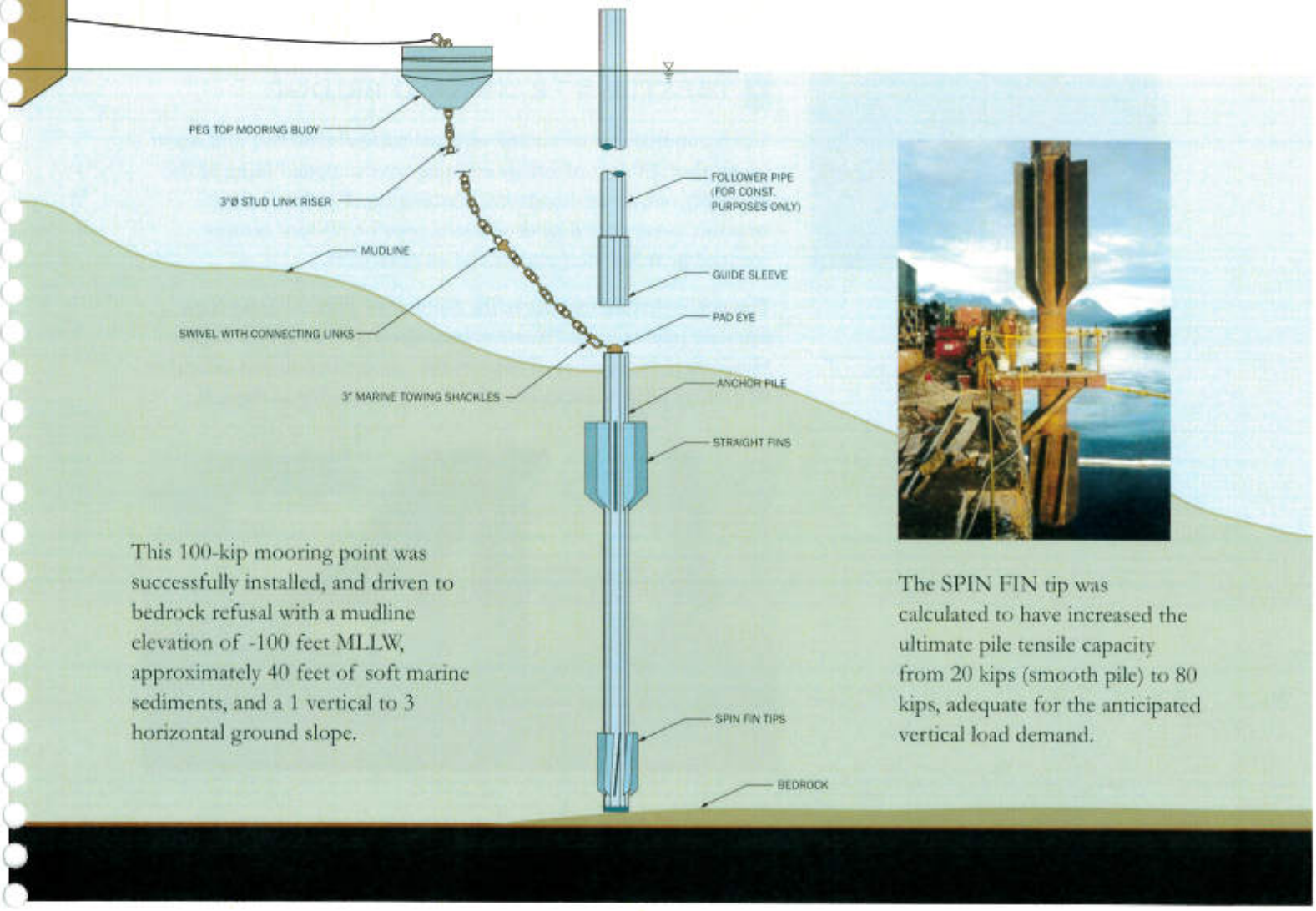



## AJ CRUISE SHIP DOCK DOLPHINS

This facility in Juneau, Alaska provides berthing for 1,100-foot-long cruise ships, and includes a series of steel pile mooring and breasting dolphins with fender systems that use SPIN FIN® piles.

Deep soft soils and structure heights of over 100 feet above seabed required some pile lengths in excess of 300 feet. The use of the SPIN FIN pile tips provided additional load carrying capacity to support mooring and breasting loads in the soft soil conditions.

## VALDEZ SINGLE POINT MOORING PILES




This 100-kip mooring point was successfully installed, and driven to bedrock refusal with a mudline elevation of -100 feet MLLW, approximately 40 feet of soft marine sediments, and a 1 vertical to 3 horizontal ground slope.



The SPIN FIN tip was calculated to have increased the ultimate pile tensile capacity from 20 kips (smooth pile) to 80 kips, adequate for the anticipated vertical load demand.

# BRIDGES

## KALAMA RIVER ROAD BRIDGE

This vehicular bridge spans the Kalama River in southwest Washington. The 380-foot span steel I-girder bridge is supported by battered SPIN FIN® piles at each abutment. The use of the SPIN FIN piles supports the bridge for dead, live, and seismic loads, and also results in a significant reduction in pile length.

## TRESTLE #7 RAILROAD BRIDGE

Seven hundred feet of curved elevated railroad structure and repair of another 200 feet of bridge crossing were designed using SPIN FIN piles outside of Longview, Washington. The new bridge structure is supported by driven steel piles on 50-foot centers spanned by rolled steel girders and an open deck.

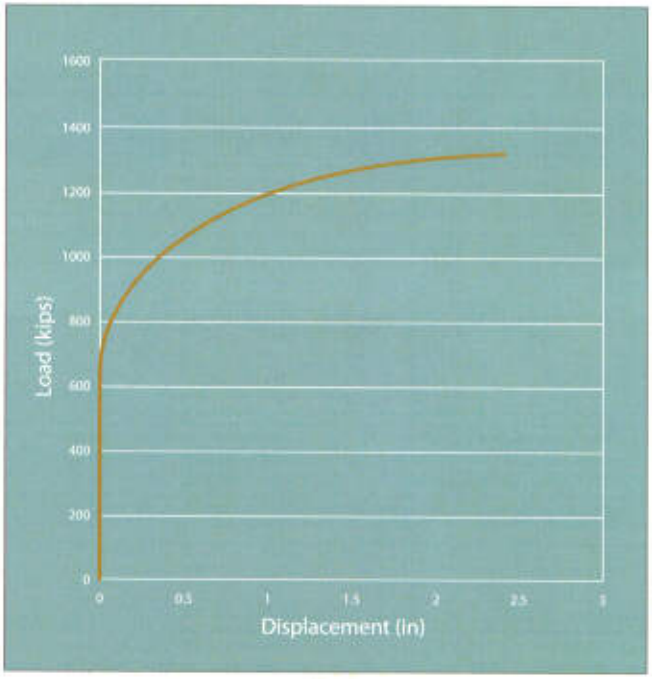
The new structure minimizes the number of piles by using large diameter piles in a rigid frame system along with SPIN FIN tips. Minimizing the number of piles in the reconstruction was critical in shortening project duration and lowering construction impacts.

## WEST DOCK CAUSEWAY BREACH

The West Dock Causeway Bridge is located along a 2 mile gravel causeway which extends into the Beaufort Sea near Prudhoe Bay, Alaska. The main bridge is a 700 foot long 4-span crossing that crosses a breach that accommodates fish passage and water flow.

Ice breaking piers incorporate SPIN FIN® pile tips for increased pile pullout (tension) capacity, modular pier cap construction for reduced field installation requirements, batter pile grouping for significant lateral structure load capacity, and driven pile technology for permafrost conditions.

A batter pile tension test was conducted using jacking frames, calibrated jacks and dial gauges. The batter pile was selected because of its high anticipated exposure to severe ice forces.




WEST DOCK BATTER TENSION TEST

Soil conditions consisted of frozen and unfrozen silts, sands and gravels; and ice lenses. In the region down to approximately -50 feet MLLW, soils were frozen due to the permafrost shadow caused by the original causeway fill. Between -50 feet and -200 feet MLLW, the soils ranged from thawed to marginally frozen. Below this elevation permafrost conditions were encountered. Thirty-six inch diameter pipe piles equipped with eight inch SPIN FIN tips were driven 190 feet.

## SEISMIC RETROFIT OF PIER 69

A new design for the Seattle waterfront's Pier 69 brought the structure up to current seismic codes. The design included a new 26,000-square-foot, steel-pipe-pile-supported dock with a concrete deck, utilizing SPIN FIN® piles for support.

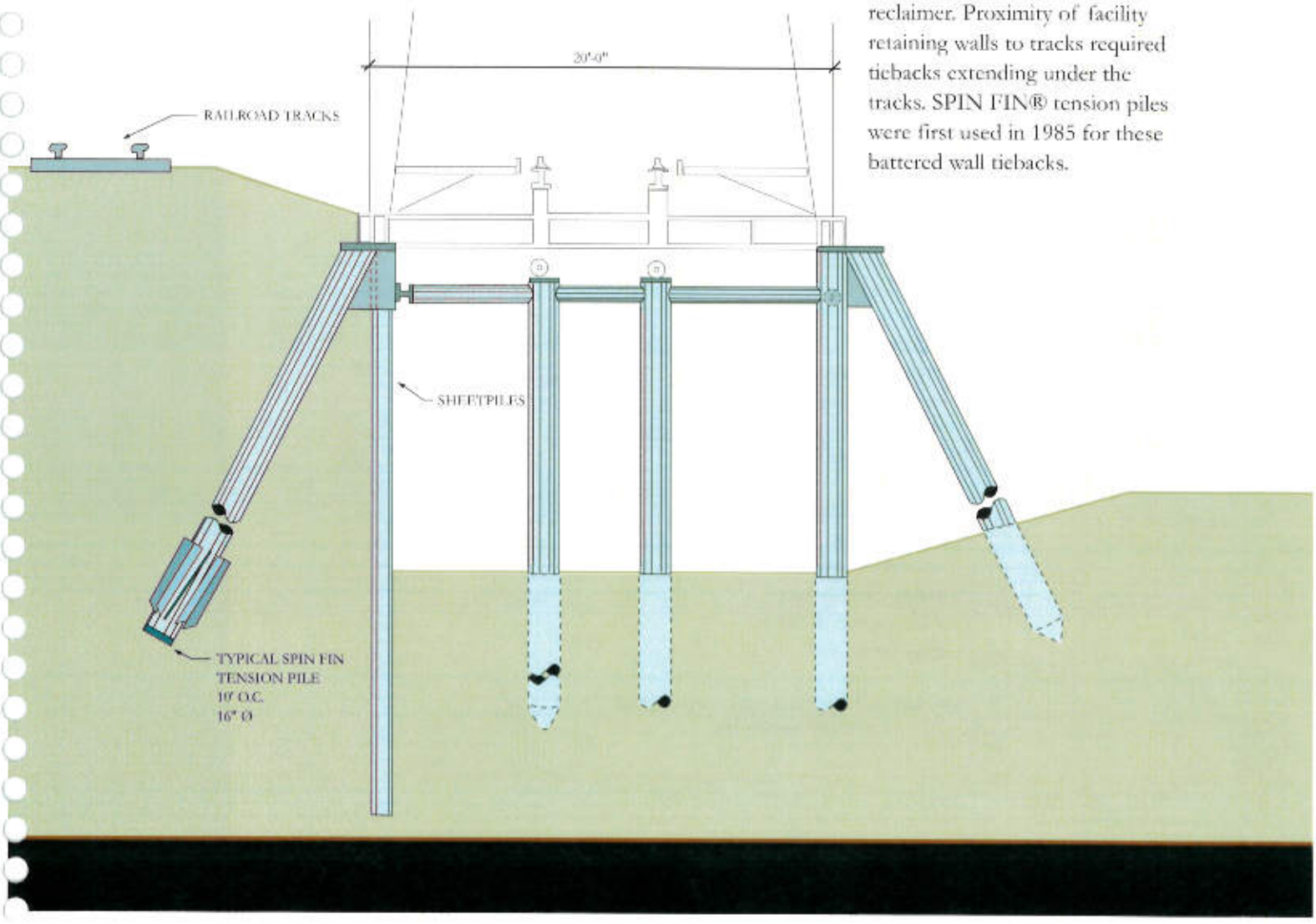
The 24-inch piles were arranged in 2- and 3-pile clusters. The new dock was then connected to the existing 85,000-square-foot, three story building. The rehabilitated pier houses the Port of Seattle's Headquarters.

# RETAINING WALL TIE BACKS

## SEWARD PORT RAIL CAR COAL DUMP

The Seward Port Rail Car Coal Dump was designed to support 800,000 tons of coal per year for export.

A part of the project included depressed rail car unloading hoppers feeding a stacker reclaimer. Proximity of facility retaining walls to tracks required tiebacks extending under the tracks. SPIN FIN® tension piles were first used in 1985 for these battered wall tiebacks.



PND Engineers, Inc. is a full-service consulting engineering firm that provides civil, marine, geotechnical, structural, surveying and construction inspection services for a wide range of projects. The firm was founded in 1979, with offices now located in Anchorage and Juneau, Alaska; and Seattle, Washington.

PND has performed planning, design, and construction inspection for a significant number of marine facilities. These projects have included the design of floating and fixed docks, passenger boarding gangways, fender systems, and upland facilities that are used by various sized vessels, including 1,000-foot-plus cruise ships, ferry vessels, and recreational facilities for pleasure craft. As a firm that specializes in these types of projects, PND has the advantage of knowing the detailed requirements related to all phases of the design, construction, operation and maintenance.

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